The Dock & Harbour Authority

No. 468. Vol. XXXIII. FEBRUARY, 1953. Monthly 2s. 0d.

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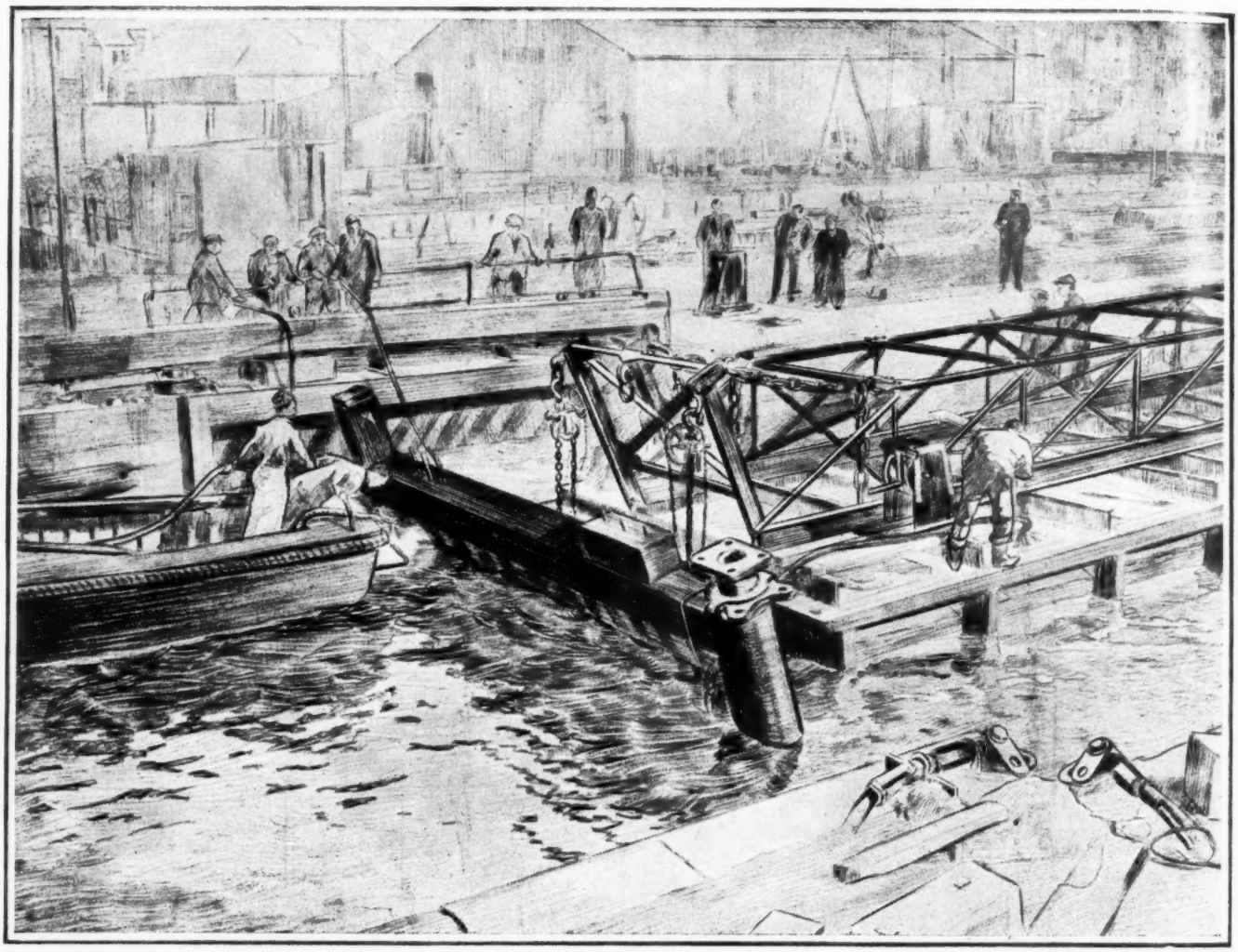

BT 139

Removing an old wooden gate-leaf preparatory to stepping an all-welded double-skinned leaf.

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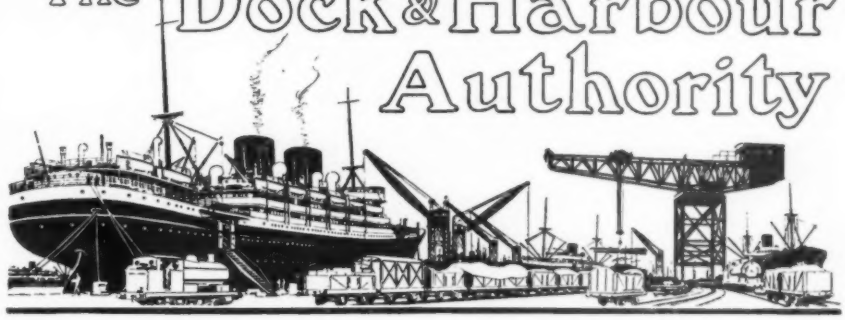

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The Dock & Harbour Authority

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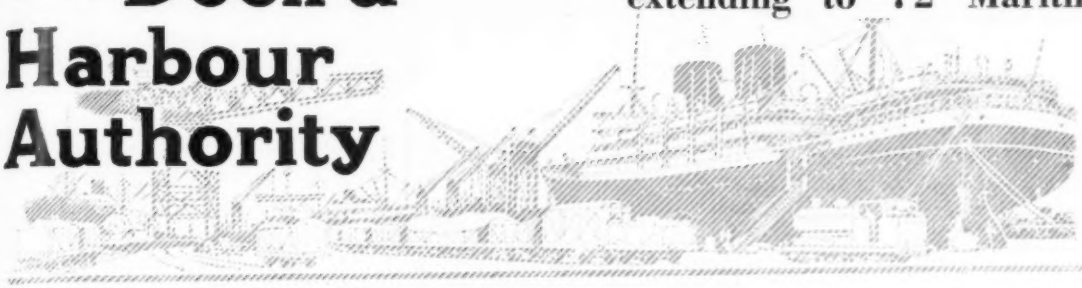


No. 388

Vol. XXXIII.

FEBRUARY, 1953

Monthly 2s. 0d.

Editorial Comments

The Port of San Francisco.

The acquisition of California by the United States of America under the treaty of Guadalupe-Hidalgo in 1848, and the discovery of gold in the same year, were two outstanding events which had a vital bearing on the development of the port and city of San Francisco. From the original Franciscan Fathers' settlement of Mission Dolores there evolved a prosperous and progressive community which is to-day the largest commercial centre of California and of the Pacific Coast.

San Francisco, situated on the peninsular dominating the famed Golden Gate entrance to San Francisco Bay, is noted for its seven hills and cosmopolitan population, and for the amenities it provides for the benefit of its visitors. Against the background of the mountains behind the bay, and the imposing Golden Gate and San Francisco-Oakland bridges, however, an empire of commerce centres on the facilities of this great port and harbour.

Through the courtesy of the Port Manager, Mr. Robert H. Wylie, we are privileged to feature in this issue an article tracing the development of the port throughout nearly 200 years since the first landing of the Spanish adventurers.

Construction of the first unit of the new Cotton Terminal, mentioned by Mr. Wylie, has, we understand, now been commenced; this terminal will considerably speed up the export of cotton, which has become California's leading agricultural crop. To eliminate traffic congestion, the terminal is located outside the business district, and as many as 7,500 bales of cotton can be delivered at one time by road or rail, assembled or stored for short periods pending shipment, and then loaded direct to ship from the wharf, which has a total area of over 57,000 square feet. The new structure is one of four ship-side warehouses to be built in the Islais Creek area by the San Francisco Port Authority.

The second phase of the port's post-war modernisation programme also includes the construction this year of the first unit of the long-planned World Trade Centre, which will provide under one roof, every facility required by international commerce. This programme is being completely financed from the Port of San Francisco's own revenue and resources, as the port organisation is an entirely self-supporting state agency.

We feel sure that our readers will find much of interest in Mr. Wylie's article, particularly with regard to the notable expansion of trade since the cessation of hostilities, and the installation of modern facilities—the unusual triangular Mission Rock Terminal being described in some detail.

New Technique in Pier Fabrication.

On a following page, our readers will find an illustrated article describing a prefabricated pier which has recently been completed in Venezuela for the handling of iron ore.

The design of this pier, which is the invention of Col. Leon B. DeLong, is of considerable interest. It is apparently based upon, or influenced by, the type of dredger which transfers to the sea bed by means of spuds, the reactions incurred by the vessel during dredging operations.

A pier of this type was successfully used at Arromanches during the Second World War, where it was known as the "Composite Pier," and which readers will remember was described in The Civil Engineer in War, Volume II—Docks and Harbours, published by the Institution of Civil Engineers.

The technique of construction and of raising the DeLong Pier is, however, quite different, and the lifting method adopted is a unique invention. The application of the new principle would appear to have many possibilities, particularly where semi-permanent or even permanent berthage facilities are required quickly, to eliminate an excessive amount of overside trans-shipment of cargo.

Sea Defence and Floods.

The early days of February, 1953, will be long remembered by the people of East Anglia, Holland and Belgium as days of tragedy. Overnight, the security of towns and villages had been destroyed with devastating suddenness by the invading floods of the sea. Desolation was widespread, and the whole world was incredulous that such a catastrophe could happen in countries like these, which enjoy a relatively temperate climate.

In the United Kingdom, the Daily Press, apart from its harrowing reports of the situation, raised a chorus of alarm and indignation and criticised those responsible for sea defences. In the House of Commons the arguments of the Press were repeated as though they were the pronouncements of irrefutable authority, and the Government acted immediately, appointing a ministerial board to deal with the situation on emergency priority level. Meanwhile the local and harassed authorities had no time for discussion, they went into action, dealing with evacuation, damming the breaches in the walls and generally effecting emergency repairs.

It will be remembered that some four years ago this Journal, recognising the necessity to investigate the condition of foreshores after the war-time suspension of coast defence measures, published a series of articles on Coast Erosion and Protection by R. R. Minikin. These articles attracted wide attention, for they were the outcome of careful research and study of much of the coastline of this country and the coastlines of the Low Countries including nearly all the present affected areas. Some of the points made by the author are worth recalling. His introductory paragraph on Coast Erosion (February, 1951, issue) reads:—

"The question of coast erosion is now almost a seasonal topic for the Press. Every winter, particularly after or during the occurrence of a gale when some more than usual damage has been done to the coast defences, there is a resurgence of opinion directed to the necessity of providing further protection against the inroads of the sea. Coast erosion then becomes a spectacular feature of the illustrated journals: an easy topic upon which to adumbrate in the leader columns of the daily Press, and a yet easier question to bring to the notice of Parliament. The curious feature about this public hub-bub is that the damage is very frequently not coast erosion at all."

Another point concerning the present afflicted area reads:—

"One of the most difficult stretches of coast is the N.E. bend of Norfolk. Here the littoral drift is north to south whereas where the coast bends westwards to the Wash, the drift is east to west. In this part of the country the land is very flat and a large area of the country would be inundated at high water springs were it not protected by earthen banks. The foreshore is flat and the horizontal tidal range is considerable though the vertical range at ordinary springs is only 6.25-ft. Almost annually breaches occur in the earth embankments fringing the coast line. The tops of these banks are about 15-ft. above H.W.O.S.T.

The occasional storm surges usually raise the water level several

Editorial Comments—continued

feet above the normal, in some parts reaching 9-ft. above H.W.O.S.T. threatening the country with disastrous floods. These storm surges which enter the North Sea round the coast of Scotland are due to fluctuations of barometric pressure. They may reach the Norfolk coast in 12 hours after passing the Orkneys. If the time of arrival coincides with, or is near to, high water, then the resulting level of the tide will be several feet above the normal."

It is at once clear that with a sea running and an abnormal high tide the danger of overtopping a sea-wall is great, and then the backing of sand or earth is rapidly washed out, making gaps through which the seas pour. The poor quality of the sub-foundations of many coast line walls, and frequently the inferior nature of the backing of lengthy stretches of these walls, devoid of protection from the weather and spray: the badly drained land behind, abounding in numberless borrow pits which owe their origin to the hurried filling of sandbags on emergency damming of breaches in the past, together with seepage through the base of the walls make most constructions of this nature hazardous.

In February, 1938, there was a gale similar to that experienced this month, which drove breaches nearly half a mile long in the walls at Horsey and Eccles, and caused large flooding, but then the surge height was less and the coincidence of the arrival and time of tide differed, so that the damage was more localised.

Along the Lincolnshire and Norfolk coasts a few decades ago there existed fringes of sand dunes (reputed in places of having been there since the time of the Romans) behind fine stretches of sandy beaches. Since that time the holiday resort impetus, summer camps and bungalow retirement towns have encouraged an amount of injudicious construction of sea walls, or other beach obstructions, not so much for defence as for the amenity value; and not infrequently the constructions were carried out by inexpert people. Some of these works initiated depletion processes in their neighbourhood for which, unfortunately, the cure took the form of fresh beach-regimen destroying constructions. For this and other reasons comparatively enormous annual expenditure for maintenance of these ill conceived works absorbs all available funds.

While matters of sea defence are to a great extent localised problems which should be the intimate care of practical hydraulic engineers, much research information and data must be gathered and studied, to ensure that what is proposed at one section of coast line is appropriate for adjoining sections.

It is our firm opinion that the sea defence of the coasts of Great Britain should be organised, cared for, and largely financed on a national basis. One Government Department might gather and co-ordinate the necessary research in the fields of meteorology, maritime and hydraulic engineering, geology and geography and be responsible for the correlation of all schemes for coast defence which are now the separate concern of many Catchment Boards and Local Authorities.

Topical Notes

Colombo Port Development Scheme.

Recent reports from Ceylon indicate that good progress is being made with the Port of Colombo's development scheme and the Mutwal Quay, the first of the 17 berths came into use on November 22nd last. Since then, erection of the sheds has commenced, and it is anticipated that the quay will be handed over for commercial use in about three months' time. The new Titan block-setting crane is in operation at the North Pier of the oil dock, and work is also in progress on the South Quay and on the widening of the Delft Quay, which is to be of cylinder construction.

The dredging for the foundations of the North Quay of the Delft Pier has been completed, and construction of the new Customs Quay, which will be 3,000-ft. in length, has commenced. The general layout of this quay provides for a 50-ft. apron, transit sheds of 500-ft. by 120-ft., a cope level of 9-ft. above L.W.O.S.T. and a depth of 36-ft. alongside at low water. Behind the transit sheds there will be double railway tracks and a two-way carriage drive together with adequate parking space. A site has been selected on the adjoining Marine Drive for a new tourist central office and bureau.

Ferry Services Aided by Radar.

The value of the Seacombe Ferry radar station as an aid to maintaining the Wallasey ferry service in conditions of low visibility was forcibly demonstrated during the recent heavy palls over Merseyside. Despite thick fog, the ferries completed the full fair-weather schedule of 86 sailings per day with two ships, whilst on a similar day in the winter of 1944-45, before the installation of the radar station, the ferries completed only 57 sailings out of a fair-weather schedule of 80. A full description of the Seacombe Ferry radar station appeared in the October, 1947, issue of this Journal; established during the previous month, it was the first commercial shore-based marine radar installation in the world. The station was completely rebuilt in July, 1949, and equipped with special Cossor marine radar designed in co-operation with the Ferries Undertaking of Wallasey.

Improvement of Port Facilities at Recife.

According to reports in the South American press, the Federal Government of Brazil has signed a contract with the State of Pernambuco for the dredging of the Port of Recife and the execution of other projects designed to improve the port facilities. The work will be carried out by the local port authorities with equipment supplied by the Federal Government. The dredging operations involve the removal of some two million cubic metres of silt at an estimated cost of 31.5 million cruzeiros (about £610,000). In addition, the port will be enlarged by the construction of 360 metres of new quays and the installation of the necessary equipment; the cost of this work is estimated at 57.5 million cruzeiros (about £1,100,000).

Modernisation of Rothesay Dock.

The Clyde Navigation Trustees, at a recent meeting, agreed to spend £200,000 in modernising the south quay of Rothesay Dock, Glasgow. The new works and maintenance committee reported that they had considered a scheme for the renewal and repair of the crane track and tramways, and for conversion of the rail layout of the quay for four berths instead of five, rendered necessary by the increased size of the ships using the quay. To minimise any interruption in the discharge of iron ore, the trustees agreed that work should be done on one berth at a time. It is estimated that the scheme will take about three years to complete.

Symposium on Timber Handling.

In pursuance of its policy of correlating latest information on cargo handling techniques, the International Cargo Handling Co-ordination Association is to hold in London, on Thursday, the 19th inst., a symposium in which certain aspects of the timber trade will be reviewed. Papers to be presented will deal with methods of timber handling, with special reference to American Ports; a new design of timber carrying ship; timber storage and timber storage sheds. A member of the Transportation Committee of the Timber Trade Federation of the United Kingdom will also deal with his personal experience in the handling of timber. Other relevant matters in the international sphere will also be ventilated. This symposium is the first of its kind to be held in the United Kingdom and it is expected that it will be widely attended by members of the Association from all over the world.

The meeting is being held on board the "Wellington," Headquarters of the Honourable Company of Master Mariners, by kind permission of the Master. Further details can be obtained from the Central Secretariat of the I.C.H.C.A., 7, Victoria Street, London, S.W.1.

With regard to the series of articles on structural timber for dock and harbour work, which we are at present publishing in this Journal in collaboration with the Timber Development Association, we regret that owing to the illness of the author of the fourth paper in the symposium, it has been found necessary to omit publication this month. We hope to resume the series with our March issue, when the subject will be "Timber for Coastal Defence Work."

The Port of San Francisco

Progressive Harbour of Pacific Coast

By ROBT. H. WYLIE
Port Manager.

SAN FRANCISCO owes its discovery to the early trade quests of the Spanish galleons. These ships in the spice trade followed one of the richest trade routes in history, between Manila and the Mexican coast of Central America. From time to time the galleons were shipwrecked or fell to the sword of a privateer, so the search for ports was emphasised by urging from the Spanish Government.

For two hundred years the mile-wide entrance to San Francisco Bay escaped the notice of Spanish and English explorers like Cabrillo, Vancouver, Drake and Vizcaino. These men made landings to both the north and south of San Francisco without discovering the harbour. Don Gaspar de Portola, searching for Monterey Bay to the south, missed this place in 1769, and after scaling Montara mountain became the first white man to see the Bay of San Francisco and its famed entrance, the Golden Gate. Portola's party pressed on to the shore of the bay and claimed the area for Spain.

Six years later, the Spanish barkentine *San Carlos*, commanded by Juan Manuel de Ayala, sailed through the Golden Gate. Captain Ayala entered in his log, " This newly discovered Port of San Francisco is the best I have seen on this coast," and " It is not a port, but a whole pocketful of ports."

The first settlement on the hills to the west of the bay was made by the Franciscan Fathers. In honour of their patron saint, St. Francis of Assisi, the padres established Mission Dolores, one of the chain of California missions. To complete Spain's claim on the area, the soldiers who followed the padres established their Presidio overlooking the entrance to the bay. This Presidio was erected to protect Spain's claims from the Russians, who finally set up Fort Ross, only 100 miles north of San Francisco.

The quiet settlement was first visited by Russian and American fur traders who put into the bay for supplies. Whalers then began arriving to take on supplies after long cruises at sea. Trade with foreigners was prohibited by Spanish law, but not prevented for there was considerable clandestine business done with these early visitors.

In 1826 the Mexicans revolted successfully against the Spanish, and California became a Mexican possession. Trade prohibitions ended when the Mexicans took over California government, and the Port of San Francisco soon became a familiar sight to American ships flocking to the port for the hides and tallow produced by the settlers. The New England sailors called the hides they took aboard " California Bank Notes " and traded laces, silks, shoes, bolts of cotton, saddles, and jewellery for the hides and tallow of the Californians.

Early Development of the Port.

The British sloop *Blossom*, commanded by Captain Frederick William Beechey, arrived at the port in 1826 and made a survey of the bay. This chart, subsequently published by the British Government, is a fine record of the bay and surrounding country as it existed then.

Another early settler in San Francisco was Captain W. A. Richardson, who left his seagoing life and became not only the first officially appointed Harbour Master, but also commanded two schooners which brought supplies from the Mission to trade with the ships in the bay.

Actual control of the port under the United States began in 1846, when Captain James B. Montgomery of the U S. Sloop *Portsmouth* landed 70 bluejackets and raised the American flag over the plaza and took possession for the United States. California was formally ceded to the United States with the signing of the Treaty of Guadalupe-Hidalgo in February, 1848, and the war with Mexico was ended.

The acquisition of California by the United States was unquestionably of vital importance in the development of the Port of San Francisco. One other event, however, gave great impetus to the development of San Francisco—the discovery of gold at Sutter's Fort in January of 1848.

Within weeks the sleepy little village had turned into a centre of feverish activity, with many ships riding at anchor in the bay. Businesses multiplied rapidly, as did the prices for the essentials of life as the demand increased. By the middle of the year the harbour was loaded with ships from every major port in the world. For a time business was excellent for the local traders.

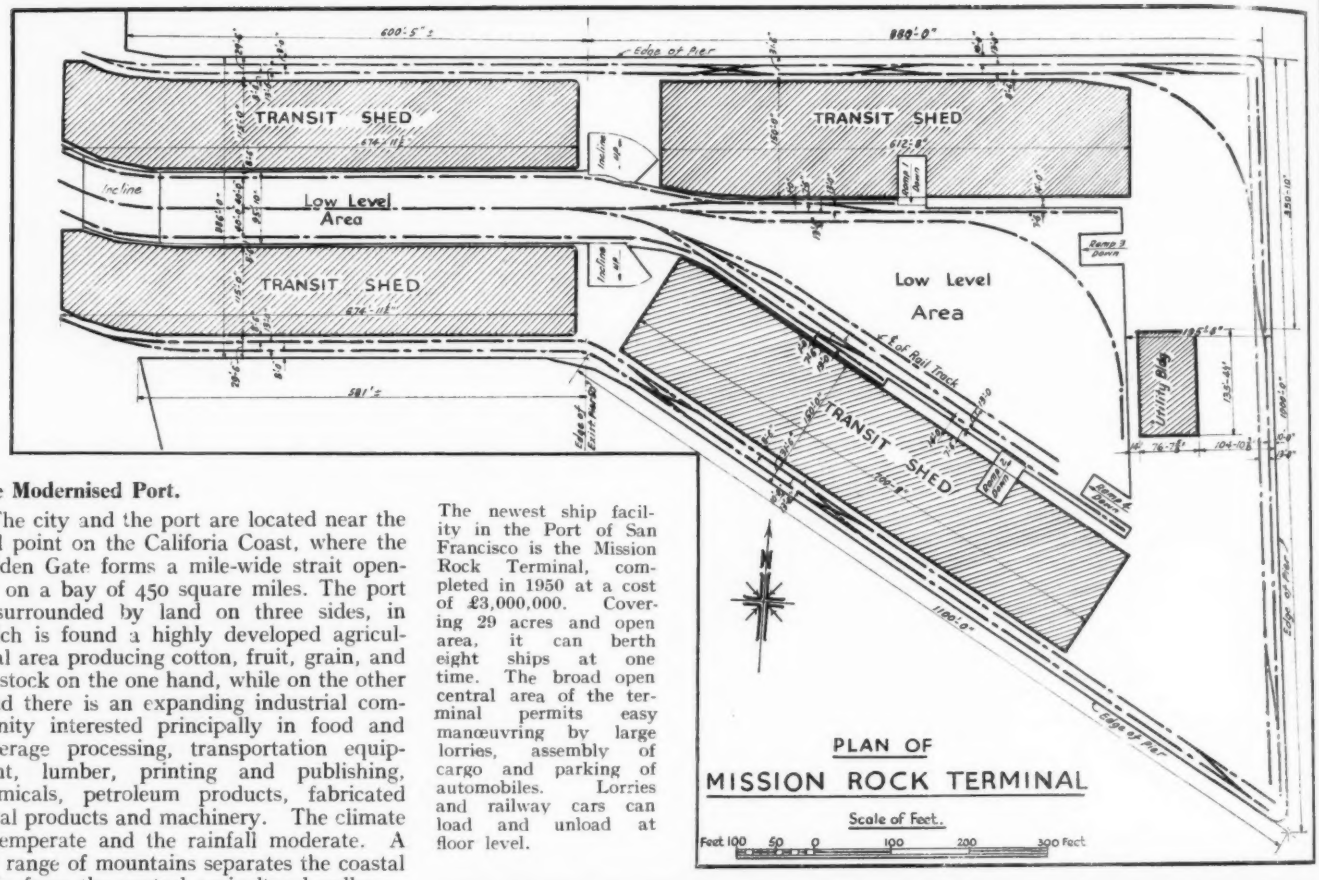
However, the gold fever soon spread to the merchants, the sailors and shipowners, who deserted their ships and businesses to hurry to the gold fields. By the summer of 1850 the bay was choked with over 500 deserted ships, most of which never returned to sea.

Aerial view of the Port and City of San Francisco. At the upper left, the Golden Gate, entrance to the great inland harbour, spanned by the Golden Gate Bridge. At the extreme right a portion of the San Francisco-Oakland Bay Bridge. The Port's 42 deep-water piers jut out from the wide Embarcadero, the principal waterfront street.

The hulls of the ships abandoned by the gold seekers found a variety of uses in the San Francisco of the 1850's. Some served as landing places, others as warehouses, one was made into a prison, and one which was beached in an area now several blocks from the waterfront became the Niantic Hotel.

As the city grew and prospered, many people came to San Francisco to open businesses to serve the booming pioneer community. As the volume of trade increased, wharves became valuable investments. However, the early wharves began to collapse by the beginning of the American Civil War in the early 1860's. In many instances, pier owners and operators were charging fantastic tolls for the use of their facilities. This situation, coupled with an exposure of corruption in the sale of waterfront lots by city officials, aroused demands for reform. By a legislative enactment of 1863, the State took title to the port and has owned, developed and operated the facilities since that time.

The Port of San Francisco—continued



The newest ship facility in the Port of San Francisco is the Mission Rock Terminal, completed in 1950 at a cost of £3,000,000. Covering 29 acres and open area, it can berth eight ships at one time. The broad open central area of the terminal permits easy manœuvring by large lorries, assembly of cargo and parking of automobiles. Lorries and railway cars can load and unload at floor level.

The Modernised Port.

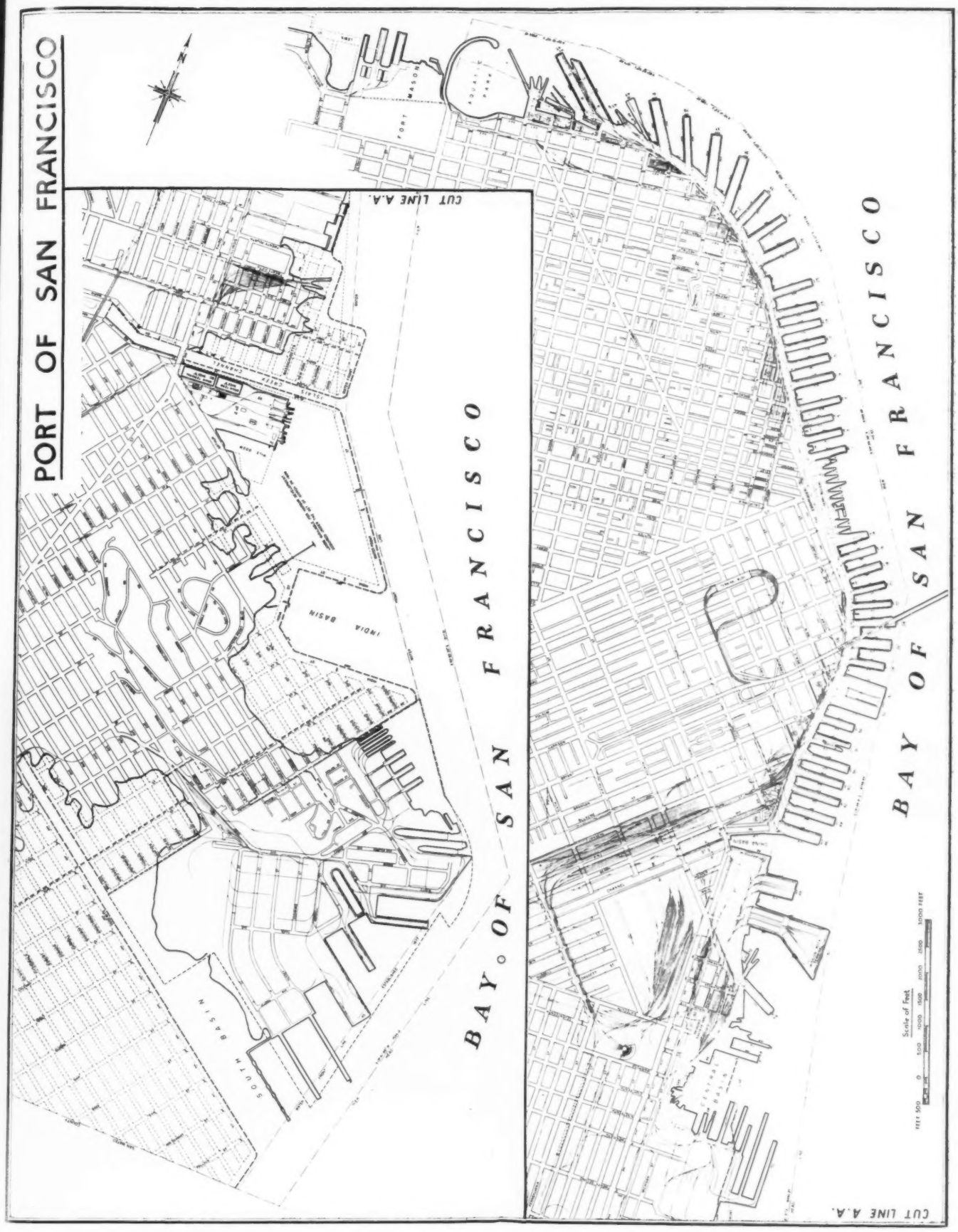
The city and the port are located near the mid point on the Califoria Coast, where the Golden Gate forms a mile-wide strait opening on a bay of 450 square miles. The port is surrounded by land on three sides, in which is found a highly developed agricultural area producing cotton, fruit, grain, and livestock on the one hand, while on the other hand there is an expanding industrial community interested principally in food and beverage processing, transportation equipment, lumber, printing and publishing, chemicals, petroleum products, fabricated metal products and machinery. The climate is temperate and the rainfall moderate. A low range of mountains separates the coastal plain from the central agricultural valleys.

The 2.7 million people who live in the nine counties bordering on the harbour have been described as the highest paid, most productive in the nation. The area has absorbed a tremendous number of people since the beginning of the war boom of 1940, matching the state increase of 53 per cent. Many of the people who came to work in the shipyards and other war plants from all over the United States have stayed; many in the military forces stationed in the San Francisco area have returned after discharge, and more people are coming every day.

The city behind the port is a cosmopolitan centre whose people have come from every country in the world, although those of Spanish, Italian, Chinese, Portuguese, Irish, and English origin predominate. This city of seven hills, famed for its port from the earliest days, is known as "The City That Knows How" because of the diversity of restaurants, the fine hotels, parks, art galleries, museums, and opera house, all available for the enjoyment of the visitor.

The San Francisco discovered by Captain Ayala nearly 200 years ago has undergone tremendous change in that period of time. The once bare hills behind the bay now form the background for the city, and the shoreline of the bay has been transformed into the finest port on the Pacific Coast. Two giant bridges span the bay, one at the Golden Gate, aptly named after the entrance to the bay, and the other, the San Francisco-Oakland Bridge, links the city with the cities to the east.

Along the famous Embarcadero, the broad street running the length of the waterfront, are spread the piers, ship berths, warehouses, and special facilities serving the commerce of the port. A few blocks from the Ferry Building, centre of waterfront


PORT OF SAN FRANCISCO
BAY OF SAN FRANCISCO
BAY OF SAN FRANCISCO
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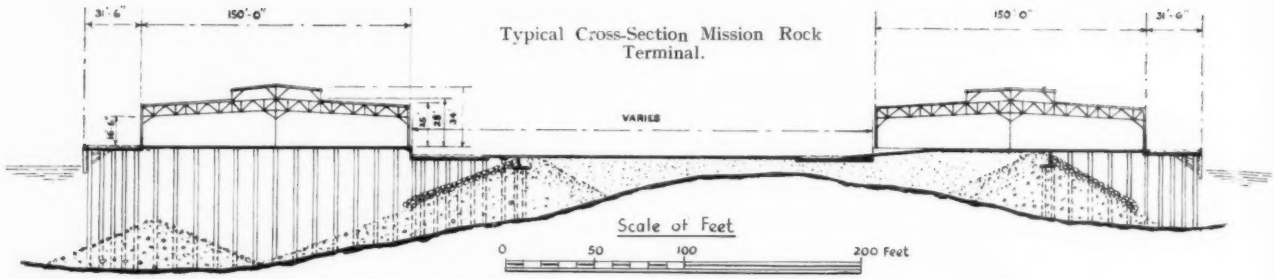
INDIA BASIN
SOUTH BASIN
FORT MASON
Scale of Feet

The Port of San Francisco—continued



Typical Cross-Section Mission Rock Terminal.

activity, is the financial district housing the steamship lines, the insurance companies, the banking houses, and the shippers who form the backbone of San Francisco's economy.

The 244 shipping lines that maintain offices or have agencies at the port send their freight in ships of many flags and nations to the major ports of the world in the ships that line the San Francisco waterfront. An average of twelve ocean-going ships a day each way enter and leave the harbour—the total exceeding 8,000 vessels a year.

A measure of the healthy trade enjoyed by the San Francisco Customs District is indicated by the exports and imports passing through the Golden Gate in 1951; this amounted to more than $757,000,000 excluding military cargo. The leading exports are cotton, machinery, dried fruit, barley and other grains, basic iron and steel, motor vehicles, evaporated milk, canned goods, petroleum products, and drugs. Incoming ships bring coffee, copra, ores, wool, sugar, newprint, burlap, nuts, rubber, and tea.

In broad terms, the facilities the Harbour Board has developed to serve world commerce consist of 42 deep-water piers with 18 miles of berthing space, 225 acres of covered and open wharf area, a State-owned belt line railroad, a refrigeration terminal, banana terminal, bulk grain terminal, bulk grain terminal, copra terminal, and a foreign trade zone.

Transportation Facilities.

Three of the principal railroads of the United States with a combined total of 27,000 miles of line serve the port, and in excess of 40 large trucking lines carry an increasing load of cargo to and from San Francisco to the East, South, and North over California's fine network of highways. From San Francisco's expanding airport, the major airlines of the world carry their passengerss to the other end of the globe.

The Harbour Board's belt line railroad operates over 67 miles of waterfront track with six 1,000 horsepower diesel locomotives, switching freight cars to and from the piers and other waterfront industries. The line serves 150 industries located on or near waterfront facilities, and interchanges freight cars with the mainline railroads as frequently as nine times per day.

Administration of the Port.

The Port of San Francisco's waterfront facilities, valued at over $120,000,000, are owned and operated by the Board of State Harbour Commissioners, a three-man Board appointed by the Governor of California for four-year terms. The present commissioners are B. J. Feigenbaum, President, and a prominent San Francisco attorney; W. P. Fuller Brawner, executive vice-president of a large paint manufacturing concern; and William G. Welt, retired railroad man. This Board sets the policies administered by General Robert H. Wylie, U.S. Army (ret.), Port Manager, who supervises the Harbour Board's 550 civil service employees. Principal departments in the Harbour Board are the Administrative, handling budgets and accounts for the Board; the Wharfinger Department, controlling the piers and making charges for pier usage; the Engineering Department, maintaining facilities and plans and supervising construction of new facilities; the Rental Department, fixing rentals and developing property ; and the Traffic Department which aids shippers in their many ocean traffic problems.

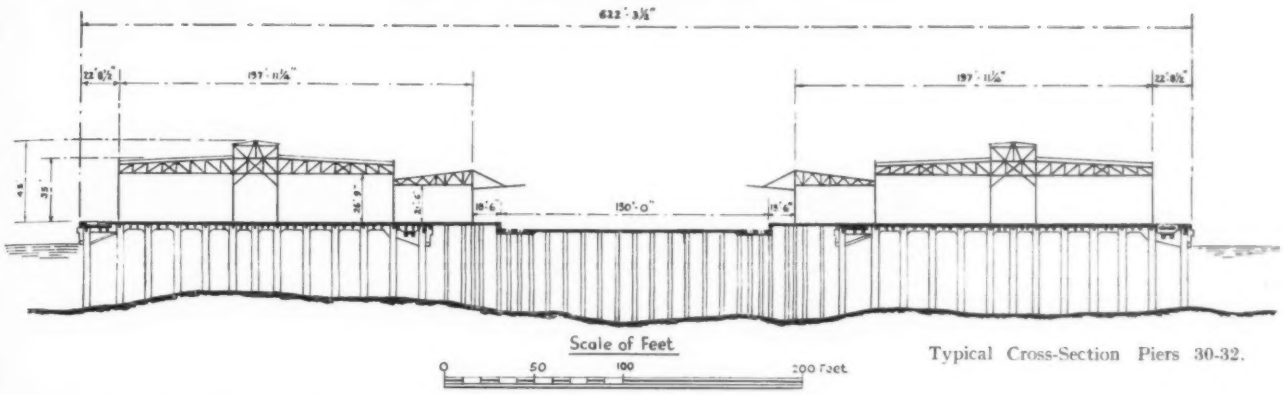
Port Facilities.

With the end of World War II, the Harbour Board felt that its facilities must be expanded, and to this end Mission Rock Terminal was planned and constructed, reaching completion in 1950. The triangular shaped facility will berth 8 ships at one time, comprises 22 acres of covered and open area, and has four large cargo sheds. In centre area there is ample space for railroad trucks, open storage, and a sufficient clearance for the largest truck and trailer combinations to manœuvre with ease. The transit sheds are reached by ramps and connecting doorways. The centre area is depressed to the floor level of freight cars for fast and economical transfer of cargo to and from the sheds.

San Francisco, like many other U.S. ports, faces solution of a problem of increasing truck traffic to and from the piers. The Port of San Francisco feels that it has made

View of Pier 30-32, which was rebuilt in 1951 to meet present-day demands for rapid and efficient cargo-handling. Most of the terminals are of the finger-pier variety, which because of their narrowness present problems in manœuvring large highway lorries. At Pier 30-32, the inner ship berth was decked over with concrete to provide a broad area for manœuvring and cargo-handling at tail-gate level. This project has proved so successful that it will be the model for future pier modernisation. The cost of remodelling was £500,000.

The Port of San Francisco—continued



Typical Cross-Section Piers 30-32.

good use of existing facilities by converting two finger piers into a modern quay-type truck-rail-ship terminal, capable of handling cargo efficiently no matter how it comes to the pier. The area between piers 30 and 32 were filled in and a concrete mat constructed between the cargo sheds, depressed to freight car floor level or truck tail-gate level, and connected with the sheds and the street outside the piers by ramps. Thus, the existing facilities are able to handle the new and expanding truck traffic as well as the traditional rail movements to and from the piers. This modernised pier will serve as a model in future port modernisation programmes.

San Francisco is a general cargo port of the first order, and the other piers have been built with this knowledge in mind. The other piers are one-storey finger piers, ranging from 600 to 1,300 feet in length and from 150 to 350 feet in width. There are railroad spur tracks on the aprons of the piers on either side. Each of the piers is capable of berthing one ship on either side, and some will accommodate two ships on a side. A total of 100 ocean-going vessels could be berthed at one time if all facilities were utilised.

Contrary to the custom in European ports, San Francisco's cargo is handled almost exclusively by the tackle carried on the freighters, for there are no dockside cranes in San Francisco. Exceptionally heavy lifts are handled by floating barge cranes.

The piers are rented to the various shipping companies and terminal operating companies on a square foot monthly basis. A few piers are kept on open assignment for companies which do not require the continuous use of a facility or for the companies who have a seasonal overflow of business at certain times of the year as, for example, the lines carrying coffee.

Foreign Trade Zone: Goods from abroad can be unloaded from ships and stored, packaged, processed and otherwise adapted for entry into the United States or for trans-shipment, all without payment of U.S. duty.

Bulk Commodity Facilities.

Among recently completed facilities are special terminals for handling copra, grain, and bananas.

Copra is the sun-dried meat of the coconut, and it has been one of the principal imports of the San Francisco Bay area for many years. In 1951, $22,446,000 of this commodity was brought into the port and processed into coconut oil. The refined product of copra is used principally in soap manufacture.

Vessels carrying copra are routed to a berth alongside a newly renovated processing terminal when they arrive in San Francisco. Two portable unloading tubes are brought aboard the ship and their nozzles buried in the loose copra. The copra is then sucked up through the unloading tubes into a hopper where it is weighed automatically and then transferred by the blower system into a 10,000 ton capacity warehouse adjacent to the processing plant. Each unloader pipe has a capacity of 60 tons per hour, permitting quick unloading and turn-round of the vessel.

In 1949 the Port of San Francisco placed its 500,000 bushel grain elevator in operation at a cost of $1, 250,000. Grain arrives at the elevator from California's agricultural valleys by freight car or by large truck and trailer combinations. The grain is stored in the elevator until a vessel arrives, and then it is transported by conveyor belt and chute to the hold of the ship at the rate of 16,000 bushels per hour. This operation has proved so successful that construction is now underway to double the capacity of the elevator.

Bananas are shipped to the Port of San Francisco by the United Fruit Company's fleet of refrigerated ships coming from Central America. The ships are scheduled to arrive early in the morning and can unload as many as 40,000 stems in a single day. After the ship is docked, large articulated conveyors are placed opposite the ship's hatches. The conveyors are placed down in the holds, where longshoremen, the men who load and unload ships, place the fruit on the conveyor belt, and it is carried over

The Port of San Francisco—continued

the side to another conveyor. This endless belt carries the bananas to a long line of refrigerated freight cars where workers take the bundles of bananas and store them in the cars. The new facility provides bruiseless handling and efficient unloading of a commodity widely distributed to California and other western points.

Refrigeration Terminal.

The Port of San Francisco maintains a refrigeration terminal as a service for perishable commodities waiting storage aboard ship. This facility has 650,800 cubic feet of space divided into compartments, each of which can be kept at the desired temperature for the particular commodity. The terminal has facilities for unloading both refrigerator cars and refrigerated trucks and berthing space for two vessels to be worked at the same time.

Foreign Trade Zone.

San Francisco's Foreign Trade Zone is of special interest to exporters abroad. Regulations of the zone permit goods to be brought in, exhibited, manufactured, processed or manipulated and prepared for reshipment before duty is paid. The zone was opened in 1948 and is under the supervision of the Board of State Harbour Commissioners.

Four different antique dealers have sold over a million dollars worth (retail value) of antiques at the zone in the past year, ranking San Francisco as one of the three foremost antique importing centres in the United States. These antiques were purchased principally in England and Scotland, with some coming from France and Italy. Other principal commodities from Great Britain have included automobiles, liquors, plate glass, woollens, and fertilizers.

Heavy patronage of the zone has necessitated application for its enlargement, planned for early 1953. This enlargement will provide the zone with more than 14 acres of covered and open wharf area, including four transit sheds, four ship berths, and railroad spurs on both ship and inshore sides.

Aids for Shippers.

The Port of San Francisco offers other attractive services to shippers. Many financial institutions, banking, insurance, and customs brokers have headquarters in the city. There are over 52 foreign consulates in the city, many maintaining foreign chambers of commerce to aid foreign traders.

The port maintains a traffic department which aids shippers or prospective shippers with routing or delivery problems. Two representatives of the port, one in Chicago for the midwest and W. Hall and Company in London for Great Britain and Europe, aid shippers away from the port.

Modernisation Programme.

In addition to the $10,000,000 expansion and modernisation programme completed since the end of World War II, the commissioners have recently authorised plans for the expenditure of an additional $8,000,000 for port improvement.

These plans include the erection of a large new ship terminal, the modernisation of an additional pair of finger piers, and the erection of the first unit of four sheds to handle the export cotton moving through the port.

Port officials in San Francisco believe that they must expand and modernise port facilities in order to continue to attract a large volume of cargo to the port. Finally, there is a conviction that the cargo coming to the port must be handled cheaply and efficiently, and future development of the port will be planned with this idea uppermost in mind.

European Storm

Widespread Floods and Devastation

The gales and floods which ravaged the East Coast of Britain, and many Continental countries, during the fateful week-end January 31st—February 2nd, brought death and destruction to low-lying coastal lands when the protecting sea defences proved inadequate and were breached. Ports and harbours suffered severely, and hardly any anchorage on the affected coasts of Great Britain, Belgium and the Netherlands escaped unscathed.

Great Britain.

The tragic loss of the m.v. " Princess Victoria " in the Irish Sea on January 31st was immediately followed by havoc and devastation along the East Coast when furious gales breached the sea defences at many points. Grimsby and Immingham docks were badly affected, whilst the Port of King's Lynn was virtually inundated and thousands of people were rendered homeless. The inrush of water at the Sheerness naval dry docks seriously damaged these installations, and the warship " Berkeley Castle " and the submarine " Sirdar " which were undergoing repair at the time.

The sea wall protecting the Anglo-Iranian Oil Company's new refinery on the Isle of Grain was breached at many points, and two miles of flood-water separated the refinery from the mainland. Work on the completion of the refinery entirely ceased, all workers being occupied on repairs to the sea wall. Flooding, to a depth of 10-ft. in many cases, occurred mainly in the pump-house and storage tank areas of the refinery, which was planned to reach an output of 4,000,000 tons this year.

Foulness and Canvey Islands were severely flooded and the entire civilian population had to be evacuated. At the new Coryton refinery, flood waters, with a tide 7-ft. above normal, breached the sea wall in 14 places, flooding the refinery area to an average depth of 3-ft., and a maximum depth of 12-ft. Throughout the country at least 288 people are known to have lost their lives, many more are still missing, and tens of thousands have been rendered homeless. It is estimated that material losses will run into millions of pounds—at least ten times the total amount spent on coastal defences during the last two decades.

Netherlands.

One-sixth of the country of Holland lies flooded, and the gale wrought havoc in the provinces of South-Holland, Zeeland, and Brabant. A national state of emergency was declared on Sunday morning, February 1st, to concentrate the country's entire resources upon the work of relieving the distressed people, and carrying out urgent repairs to the dyke defences. Normal internal communications in safe areas were cancelled, or reduced to a minimum, so that all transport could be diverted to the double task of conveying dyke-workers to the breached defences, and rescuing the many hundreds of people whose lives were threatened by the floods.

At least 873 people are known to have lost their lives, and tens of thousands have been rendered homeless, whilst the damage to farmland and livestock losses has dealt a severe blow to Holland's seven-year efforts to restore her economy after the devastation of war. Fortunately, the Afsluitdijk (Main Enclosing Dam) which protects the new polders built on the former Zuider Zee bed, withstood the pressure of the furious seas whipped up by the gale, but in at least one vital point on Walcheren Island—near Fort Ramekens—a considerable breach was made in the island's surrounding dyke defences. The town of Veere was badly inundated, and the Rotterdam-Hook of Holland rail services and the cross-channel services to Harwich were suspended for 48 hours. Rotterdam itself was partially flooded, but the tunnel under the Meuse connecting the two parts of the town remained open even during the worst period. It is estimated that the total damage amounts to at least a thousand million guilders (about £100,000,000) although this figure should be taken with reserve.

Belgium.

Damage is estimated at 1,000 million francs, and several coastal towns, particularly Ostend and Knocke, suffered severely, but fortunately little loss of life has been reported. At Antwerp the River Scheldt overflowed and the position in the dry docks was particularly serious, several ships being damaged by the inrush of water. The Kruisschans and other locks suffered damage, but normal working was quickly resumed and temporary repairs effected. The completion of the new Baudouin lock has been delayed by at least two months. Port operation was restored to normal on Tuesday, February 3rd, although the Pilotage Services warned against all navigation on the Scheldt at night until buoys and beacons had been checked and put in order.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American Methods of Port Working

A Review of International Opinion

OUR esteemed Belgian contemporary " Lloyd Anversois " of Antwerp has latterly been propounding and examining the question concerning European ports and what they can learn from American methods and port practices. The question arose in the first place from an article in " The Dock and Harbour Authority " by Dr. Neumann of Hamburg, which had evidently been studied with great care, indeed the review developed into the leading article in a series of seven weekly issues.

Equipment.

On the whole, the writer confirms many of Dr. Neumann's arguments, and quotes in support extracts from a report of a French Maritime Mission which recently visited the U.S.A. to study the layout and equipment of American ports. It is generally agreed that the American system of timber piers, of light narrow construction and devoid of fixed mechanical handling equipment, achieves simplicity and maximum economy of capital cost. Even the sheds which occupy almost the whole width of the piers, leaving a narrow apron only between the shed sides and the coping, are constructed to extremely light scantlings. Another feature of these piers which strikes a European approaching the quayside, is the absence of the familiar sight of slender looking crane jibs towering aloft above sheds and ships, like so many arrows pointing skywards. For heavy lifts, above the capacity of a vessel's equipment, there are fixed cranes in the port, but to use them means loss of time unmooring, moving, and remooring a vessel; there are also, in some ports, floating cranes of great capacity; nevertheless, the American attitude appears to be that a vessel must accommodate itself to the convenience of the wharfingers—even to the extent of having to change moorings to discharge into particular rail waggons on another quay, rather than bring the waggons to the vessel's berth.

One learns that most of the piers are private property and are run for maximum profit at minimum expense, whereas in Europe most of the ports are communal properties, and the extent of the financial gain does not dominate the administration or operation. Americans argue that the cargo handling equipment of a vessel is usually adequate and should, therefore, be used to the full. Again, the expanse or straggling nature of American ports, and the large number of short piers, results in a small quayage use ratio per ton/metre and hence, say the Americans, a costly mechanical installation on the quays would not be worked sufficiently, whereas mobile lift-trucks can be used where required.

The conclusions of the French mission on mechanical handling plant were not sufficiently well defined, but the reviewer found that Dr. Neumann marshalled his facts, figures, and experience of busy European ports so profoundly, that his conclusions were helpful and convincing. This proved to be particularly opportune, since the reconstruction of the Escaut Quay at Antwerp was under consideration, and the Central Council of Economy had already suggested that the less costly American methods should be more closely examined and if practicable be adopted.

The writer quotes freely from Dr. Neumann's article and generally supports the arguments against the adoption of the American system of cargo handling, and has this to say of the profit side of the two methods. If one calculates the output per docker gang it is evident that the American system is most favourable, but if the yield is considered from the shipowner's angle, that is the despatch of the vessel, the European system of a sufficiency of mechanical quayside equipment is much more efficient and beneficial to the port. Another point emphasised is that most American ports are exploited on a purely commercial basis by enterprises solely concerned with monetary profit. It is normal practice, therefore, to base the utility on gang output as it is that which determines the profit on the whole.

Opposed to this, the large sea ports in Europe are actually run as Public Authorities at the disposition of an international community. Of course, individuals gain their livelihood also, but generally the public service character predominates. It is therefore a natural concern of the controlling authorities to give service to their clients and the most effective way of doing so is a quick turnround of a vessel.

In summing up, the reviewer is convinced that for most of the European ports the qnayside crane is essential for economy and efficiency of Maritime transport.

[The following matters are the expressed opinions of several representative Continental authorities on port operations in different countries, comparing American practice and behaviour, as observed by them personally, with that of their own countries. Like all personal opinions howsoever well founded they open up contentious problems bristling with awkward dilemmas. Even when opinions on a common particular subject are at variance, one cannot justly hold (apart from established principle or mathematical proof) that one or the other is wrong or that the observations were imperfect or faulty. Human behaviour on matters affecting livelihood even of the most trivial consequence is frequently unpredictable: it certainly never follows a regular pattern. Most of us would agree that the frontiers of a country enclose more than an economic system: they are the boundaries of differences of feeling, of differences of point of view, of differences of a way of life, and wide variability of action and motives. Then if the German, Dutch, French, Belgian and Italian reaction to the American methods all differ, in part at least, to the British way of thinking, that does not imply that there are errors of judgment or lack of perspicacity. It is more likely that the background of the national mentality and tradition is different not only to our own, but to other nationalities also.

Now America is a comparatively new country with a heterogenous population, people of many lands, and therefore it is possible that Continental observers of a less insular background than ourselves may have a keener insight into the characteristics of American humanity than we possess. As we well know, workers in the mass do not represent a rationalised mentality, they seem to become ponderous human automata easily swayed by fatuous arguments of petty leaders, from the smaller groups upward. It is essential therefore that we should weigh all authoritative opinion with patience if a sure solution of the relationship of man and the machine is desired.]

MAN AND THE MACHINE

The Importance of the Human Factor.

[The above is mainly concerned with the comparison of the mechanical equipment of ports, and as the writer points out it is one only of the main factors of difference: there is still another of equal if not greater importance and that is the human factor. As a basis for discussion the reviewer takes the report of the French Mission to the U.S.A. May-June, 1951.

At the outset it should be recorded that most of the several foreign missions to the U.S.A. to examine and familiarise themselves with industrial conditions, agree that the relationship between management and workers in America is excellent. They are also in agreement that it is this friendly atmosphere that smooths over difficulties and is the principal element of the unparalleled high productivity. The agreement of the missions on these two features of American behaviour was unanimous, in fact, they laid particular stress upon the ardour and the rhythm of team work in American port activities, even to the extent of recording that " the lumpers work to one single purpose with despatch and ease that appear almost effortless."]

* " Handling of Cargo at European and U.S.A. Ports " by Dr. Ing. Hans Neumann. " The Dock and Harbour Authority," June, July 1952 issues.

American Methods of Port Working—continued

Mr. M. Callet, the well-known Director of the Port of Havre, declares: " It is instructive to recall briefly the social atmosphere of the United States. Productivity, one says it often, is before all a state of the will. The American wage-earners know that they will benefit largely from the profits of their employers, and not, after all, by the juggling of formulas, of promised bonuses, or from share-outs which are extremely rare, but actually by the increase in the amounts in the wage packets that result in fact from the increase of yield or production. The prodigious economic expansion that has permitted the industrial equipment of their country, and in consequence, the elevation of the living standard are as evident to the American worker as they are to foreigners. There is, therefore, no bias against the introduction of labour saving machines. The devotion to progress and the taste for innovation are assuredly fundamentals of American psychology. That which has impressed us most about American port workers is that the docker does not seem to expend any great physical effort in his job nor show any haste in what he does, but when he uses his machine he gets the maximum out of it. Nevertheless, the fear of unemployment is still present not only with the docker but many other American workers who cannot forget the 14 millions unemployed in 1932. This fear shows itself in the resistance to the reduction in the strength of cargo-handling gangs, althongh in no way does it influence them in their productive capacity level."

The Belgian reviewer comments: let us note in passing that in many European ports dockers object frequently to mechanisation and even with its aid they force the slowing down of work to an extent that the production level is often reduced, much less maintained, despite an increase of strength of gangs. All this happens with a guaranteed minimum wage putting the workers above the dire effects of any unemployment that they shall have, in part, provoked by their exaggerated unreasonableness. Whilst it is probably wrong to speak of individual dockers in this wise, it occurs with them as a body. Perhaps to lay the blame for this incalcitrant behaviour on the dockers' shoulders would not be wholly just as more often than not he is acting on out-worn trade union injunctions mouthed by irresponsible elements.

The American Trade Union Atmosphere.

Mr. Callet has this to say of the trade union movement in the U.S.A. : " The unions are powerful, financially and politically. Their actions exclude all Idealogy and are concerned only to find the material satisfaction of their members. They collaborate with the employers in all measures likely to better the returns and the traffic: the adoption of new methods and the putting into service of new equipment. For these, agreements are drawn up which fix the proportion which shall come to the workers from the profits of the methods and machines."

The French Mission on the same subject says: " The Wagner Act or National Labour Relations Act (1935) is principally based on :

(a) The necessity for the freedom of Trade Union organisation.
(b) The obligation of the Employers to recognise the elected representatives of the Unions and to negotiate with them on the collective bargaining principle.

" This law was not popular with the employers and in 1947 was revised by the introduction of the Taft-Hartley Labour Management Relations Act which included (i) limitation of the right to strike and of boycott, (ii) introducton of certain procedures of injunction and of penal restrictions, (iii) prohibition of the practice of the ' Closed Shop.'

" Later, in 1949, the Fair Labour Standards Act covered the following items:

(a) minimum fixed wage on hourly basis (which was originally 25 cents for the first year, 30 cents for the following six years and 40 cents for the eighth year and upwards) was increased to 75 cents minimum from January 25th, 1950.
(b) the weekly hours of work were fixed during the first year at 44 hours, second year 42 hours, and 40 hours for the third year onwards.
(c) determination of overtime for over 40 hours at one and a half times the basic hourly wage.

" Generally these regulations are in principle also applicable to dockers and longshoremen, but modified and adjusted to fit in with the variations of the particular requirements of the jobs and the customs of the ports."

Thus we may assume, says the Belgian reviewer, that if the power of the American Trade Unions appears as great as that of the European Unions that power is utilised more directly to satisfy the material needs of the workers. That comes from the fact that the American legislator has fixed limits to Trade Union power in a manner to avoid abuse. There is also the social atmosphere in the better co-operation between employer and the trade unions which is of great importance.

The French Mission continues: " Organised little by little according to the natural laws of reaction against the past brutal exploitation of men by the financial powers, and also for the development of those enterprises which employ their members, the trades union movement in America has grown up in a favourable sense for the interests of all, employers and wage-earners.

" The larger Unions are pre-occupied with the ' way-of-life ' of each American worker and do not consider themselves as simple groups of workers but as business organisations of which the essential traits are opportunism and commercial sense to further the returns of their members."

Trade Union Organisation in the U.S.A.

The French Mission comments: " The American and the European Unions appear to have similar set-ups, and it is only in Great Britain with the Trade Union Congress that there is a total unity of purpose and trade union action. Everywhere else, the U.S.S.R. excepted, that which it is convenient to call *pluralism* characterises the movement for the defence of the interests of the wage-earners. This pluralism is much less marked in the U.S.A. than in Europe. It appears that the acts and the decisions of the big Union leaders of the U.S.A., who are all powerful, facilitate periodically (and it is actually the case) a re-grouping or a unification.

" There are two important and powerful unions in America and a number of small confederations. The recruitment goes on all the while, the larger Unions absorbing many local lodges in the territory. Altogether there are 16 million workers in the Unions. that is about 25 per cent. of the eligible population. The principal organisations are the American Federation of Labour (A.F.L.) and the Congress of Industrial Organisation (C.I.O.). The A.F.L. represents about 50 per cent. of all the American Unions and controls, for example, among others the East Coast and Gulf dockers (International Longshoremen's Association). The dockers of the Pacific Coast in the International Longshoremen's and Warehousemen's Union were formerly attached to the C.I.O., but are now independent. Besides these two formidable groupings there are the powerful United Mineworkers (U.M.W.) of about 600,000 members led by the famous John Lewis, and also the Railroad Brotherhoods and the International Association of Machinists."

These Unions are in a strong financial position thanks to substantial contributions and high entrance fees, even up to 50 dollars. The dockers pay three to five dollars per month. In this connection one observes one of the most remarkable features of the American social atmosphere in the fact that the trade union subscription is collected by the employer from the pay packet and handed over to the Unions.

Trade Unions and Employers.

Again quoting the French Mission: " The Unions possess more than those of any country in Europe, freedom of access to the inside workings of the companies of the U.S.A. According to law it is the larger and the more powerful of the Unions involved which has the right to appoint the representatives to negotiate agreement with employers. This right can be contested and then an official body, the National Labour Relations Board, has the competence to rule and make decisions.

" Among the Agreements reached between Employers and the Unions there are those which lay down certain forms of procedure, and some of these have been ratified by law, as for example the manner of engaging labour in a :

(a) Union Shop. An employer can arrange with the Union to engage only persons who are already members or shall become members of the Union after hiring. In this case the employer can engage his labour requirements direct

American Methods of Port Working—continued

(b) Closed Shop. The employer is obliged to engage only members of a Union. In this case the hiring is in principle assumed by the Union. If it cannot furnish the labour necessary, and the workers are recruited outside by the employer, they must join the Union before commencing work.

" These two systems are accompanied by the prior agreement that the employer shall be responsible for the collection of the Union subscription from the workers' wages. This is the ' check-off ' authorised by the Taft-Hartley law in spite of the fact that this same law condemned the ' closed shop ' and regularised the ' union shop.'

" In the merchant marine and in the cargo-handling industries of the ports the practice of the closed shop is still current: it has been ratified in certain agreements by a clause known as the ' Hiring Hall Clause.'

" In France the closed shop operates successfully. Employers and the Unions agree that it is better adapted than the Union shop to the needs of industry because it permits the recruitment of selected workers: security and production are therefore better is the opinion of the employers, and wages are therefore better say the Unions.

Workers and the Trade Unions.

" The International Longshoremen's Association of dockers of the East Coast of America is presided over by Joe Ryan, a man of great independence of character. This is apparent in his stand to maintain the closed shop principle in opposition to the government regulations. He has also shown opposition to the government plan for the decasualisation of dockers. His Union has 70,000 members, of which 15,000 are employed in New York. Generally it is the New York groups of dockers who propound and pursue betterment claims although many of these are not supported by the dockers of other ports. One must admit that in New York the conditions of life and of work are, at the same time, better for a small number of dockers (by reason of the mentality of certain very active groups showing self interest: for example foremen), and worse for the greater number. To improve these undesirable conditions the Roman Catholic Church of New York has made several protestations and representations to the Federal Government.

" On the whole the directions of the I.L.A. are followed by all the branches, and the unity of action at work is a signal proof of a better situation than occurs in Europe."

The Belgian reviewer concludes that one may draw from the above that, briefly, there is a wide difference between American Trade Unionism and the European. Further, the American system seems the more favourable both from the employers' point of view and the unions. The foundation stone of that superiority, he says, can be named in one word—" loyalty."

[Perhaps the British climate and the level of discipline of our upbringing, not forgetting frequent arduous physical employment of a great part of our leisure in regularised outdoor exercise may dull the imagination, but it certainly prevents us jumping to hasty conclusions on insufficient evidence. Loyalty is hardly the word we would use in this connection, for in the knowledge that there is always a large reserve of unemployed hanging around the New York docks, we would naturally think that a sufficient circumstance which could temper the behaviour of the erstwhile lucky worker's anxiety to please.

Human nature co-related with the necessity to earn a living becomes energised to a high degree, for good or ill, and groups of people organised like the unions to protect and advance their status and wages do not examine the wisdom of their actions when the pretext is a probable gain to themselves. A current event, at the time of writing has been reported by the newspapers; the caption reads: " Strike holds up unloading at New York Docks." One thousand longshoremen came out on strike and held up a large number of first class liners: the foremost of the world's fleets representing scores of millions of invested capital, besides disrupting the sailing programmes and causing great commercial inconvenience and expense. It was a sudden strike and, on the face of it, is perhaps one of the most wanton that it would be possible to imagine; a more trivial excuse to hamper industry and the cleansing of un-social behaviour would be hard to find."

" The longshoremen struck as a protest against the State Commission's action in summoning some of their union leaders to give evidence at an investigation of waterfront crime. Mr. Joe Ryan, president of the International Longshoremen's Association, said he expected the men would return to work to-morrow."

Mr. John Lyon, Chairman of the New York Shipping Association, said the strike was a " flagrant violation of the contract and an abortive attempt to interfere with the State Crime Commission."

Lord Crook, Chairman of the Dock Labour Board, was among the Queen Elizabeth's passengers. He said such a strike " would not be possible in England." " In England, labour leaders would be able to control a strike like this because they have taken the firm line that when members wanted to use union machinery for political ends they are considered out of line."

This action and the commentaries are indeed trite answers to some of the debatable observations of our Continental friends, yet it would not be wise to be too positive in conclusions.]

SOCIAL SECURITY

In the U.S.A. social legislation crystallises itself in social security and collective bargaining, for the former the obligations of the employer are precisely defined and, briefly, are :

(1) To provide adequate assurance of his employees against accidents at work with a private assurance company.

(2) To set aside for the benefit of his workers ample contributions for old age pensions.

(3) To contribute for all his employees the full quota to the National Unemployed Assurance Fund.

These three legal obligations represent a charge of about 15 per cent. of the wages; besides this, there are several benevolent funds for paid holidays, illness benefits, etc., privately arranged so that in many cases the full social charges to the employer represents, in sum, double the legal liability. One of the peculiarities of the vastness of the U.S.A. is that all organisation of work based on the application of important Federal social laws elaborated by the Government is applied by the several States through their own legislature. The French Mission continues :

" In matters regarding the regulation of labour, the Federal social legislation is comparatively recent. It was initiated in the administration of President Roosevelt. In 1935 the Congress adopted the Social Security Act which has been revised several times to meet conditions, but still remains behind similar acts of European countries. Some of the main defects are due to (a) the superposition of Federal and State laws, (b) the multiplicity and diversity of these laws which affect the reasonable and uniform application over the whole territory of the U.S.A., (c) the difficulties of the employers to replace their own existing (privately sponsored) set-ups, which before 1935 anticipated in many cases the assurance schemes.

" Public Assistance has been in operation in the U.S.A. since 1930, the year of crisis in social affairs.

Unemployment Insurance.

" The U.S.A. has created a special fund for unemployment which is fed by 3 per cent. of wages paid in by the employer. Each State receives the contributions direct from employers within its jurisdiction, of which 10 per cent. is placed to administrative services. The unemployment allowance is payable to a worker should he have been working for six months or more in any enterprise immediately prior to his application. It amounts to 26 dollars per week. Certain States add allowances for the cost of living to a maximum total of 33 dollars per week. The maximum duration of the grant is 20 consecutive weeks and has no relation to the social situation of the person."

[The last detail the French Mission admits is on a higher level than in France but hints with tact that it is subject to some abuse.]

American Methods of Port Working—continued

Old Age Pensions.

Since New Year's Day 1951, in accordance with Federal law, about 45 millions of American workers have the right to a pension at 65 years of age. The employers and employees each contribute 1½ per cent. of the wages. It is to be noted that this figure of 1½ per cent. shall be progressively advanced to 3.25 per cent. in 1970. The amount of the pension for the married docker is about 90 dollars per month. A widow receives a reduced pension.

Accidents at Work.

Regarding cargo-handling in the ports the " Longshoremen's and Harbour Workers' Compensation Act " was passed through the Houses of Deputies and Senate in May, 1928, and included the following fundamental regulations :

(a) obligation for all employers to cover fully their employees against accidents at work by adequate assurance.
(b) no payment for the first seven days of incapacity.
(c) determination of payment at a minimum of 12 dollars and a maximum of 35 dollars per week.
(d) determination of payment at 66.6 per cent. of the weekly wages of the injured for total incapacity, temporary or permanent, so long as the incapacity lasts.
(e) fixing of amounts for partial incapacity of a permanent nature such as,
280 weeks for the loss of an arm,
248 weeks for the loss of a leg,
212 weeks for the loss of a hand,
140 weeks for the loss of a finger, etc.
(f) in case of death resulting, a widow and family shall receive compensation on the basis of 35 per cent. of average earnings plus 15 per cent. for each child. Funerals shall be paid for up to 400 dollars maximum.
(g) the wages shall be first determined before fixing the amount of the compensation.
The charges for the assurance vary but for New York the cost to the employers is,
15.396 per cent. for dockers on board,
10.642 per cent. for dockers on land,
4.481 per cent. for charge hands,
0.121 per cent. for checkers.

" On the average it amounts to a round figure of 12 per cent. for accident assurance. Besides these legal benefits, many firms have benevolent and provident funds as assurance against sickness and temporary disabilities. Generally the assured receives 26 dollars per week for temporary disablement lasting 4 months, 8 dollars per day for hospital treatment over the same period and 248 dollars for surgical operation if required.

Collective Bargaining.

It has been said that collective bargaining is the rock upon which the Unionism of America has been erected. The proportion of the workers covered by collective bargaining varies considerably, dependent on their trades and the region. The vastness of the U.S.A. and the diversities of States' outlook makes it difficult to sum up the attitude of the whole. As far as the port workers are concerned the Pacific and the Atlantic coasts are, in a sense, separate regions linked up nominally. A number of conventions have been held by the cargo-handling industry according to the States, ports or groups of ports under the guardianship of the I.L.A. affiliated with the A.F.I. On the Pacific coast the I.L.W.U. arranged conventions with the Stevedores in their region.

Some of the principal dispositions arising from these conventions are as follows:

Normal Duration of Work and Wages. The normal duration of work has been fixed at 40 hours per week on the Atlantic coast and 30 hours per week on the Pacific coast. On the east coast the normal week is Monday to Friday inclusive and daily 8 to 12 and 13 to 17 hours. Work outside of these hours carries a supplement of 50 per cent. All wages are fixed at hourly rates; wages for the job are rare. In New York the wages of a lumper working on general cargo are a little more than 2 dollars per hour. This seems high when compared with European standards but sole comparison with money amounts would not give a just idea of the relative values. It would be more fair to compare the purchasing power in the respective countries in terms of how long it would be necessary to work to buy a given article.

" The table drawn up by the French Mission of the comparative values showed that it would take a French docker twice as long as an American to earn a loaf of bread, 4.2 times as long to earn a pound of sugar, and 5.3 times as long to earn an equal packet of cigarettes. However, this is not the full picture, for when it comes to domestic life the cost of running a home is equal in both countries. On the whole it appears that the power to buy various articles is more favourable to the American worker.

Holidays with Pay. Only recently has this matter received attention in the U.S.A. and only through collective bargaining has it been possible to ensure to the unemployed docker a week's holiday with pay after 800 hours of work, and two weeks after 1,350 hours of work. Besides these there are the 6 days' legal holiday with pay.

Arbitration. In this there has been considerable progress. In the ports agreement has been reached to exclude recourse to lock-outs and strikes until all measures of arbitration have failed. The arbitration body is generally composed of two employers' delegates, two workers' delegates and a neutral chosen mutually by the first four members.

Engaging Labour. It is usual for a foreman to engage extra labour in what is termed the ' hiring hall,' although in New York and in other extensive ports, it is possible to engage men at pier centres. Apprentices for dockers qualify by experience only, with the exception of certain specialists for whom the unions arrange set courses."

Foremen are engaged by the employer.

Social Atmosphere.

The French Mission concludes its report regarding the social atmosphere of the American workers in the following terms:

" It would be regrettable to omit recalling our impressions of the relations between employees and employers. It is indisputable that they are based on mutual confidence and the common wish of collaboration; which does not exclude the claims, even to the most exacting, on the tradesman level. This situation shows itself particularly in the application of the agreements. These are respected scrupulously by both sides, which gives a great security to all. There is undoubtedly in the American character that quality which makes for co-operation and harmony between employers and employed. Another characteristic of the American is the easy way he fits in with others in the accomplishment of a task, each man knowing and doing that which is expected of him: at the same time he does not become a slave of routine but strives to improve method and output. These are moral qualities which go to the improvement of living standards. He therefore sets a fine example to the workers of the world in the attainment of a high level of ' way of life ' by his individual effort and mutual understanding."

[It is fairly obvious that our European friends are enamoured of the American human relations as between worker and employer. It is also apparent that they consider this as due to favourable characteristics of the American worker, saying little, excepting in figures, about the character of the employer. In this connection it would be profitable to reflect upon certain attributes of the American character as outlined by Professor Maier of the University of Michigan in his recent book on " Human Relations " in Industry.

He expounds at some length that to achieve a happy atmosphere among people of apparently opposing interests such as master and servant, boss and men, employer and worker there must be common understanding. At least one of them must be endowed with sympathy for the other's point of view. This sympathy must partake of a broad-minded quality emanating from a mental or emotional set up desirous of and working

(continued on page 302)

Port Marine Salvage

Raising the "Empress of Canada"

By Capt. H. V. HART, R.N.R. (retd.).

Prominent among shipping casualties of the month of January, was the loss of the *Empress of Canada* in the Gladstone Dock, Liverpool, and to which, owing to its somewhat unusual circumstances, considerable prominence was given by the Press. This vessel, a 20,000 ton liner, formerly the *Duchess of Richmond*, and owned by the C.P.R., was lying at her berth in the dock, after the completion of a refit, when she suddenly became on fire, and after extensive fire fighting efforts, heeled over and sank. As the result of this casualty, not only the owners, etc., are faced with considerable pecuniary loss, but the Dock Authority, in the form of the Mersey Docks & Harbour Board are deprived of the use of a valuable berth, for several months, and are also confronted with the problem of the most formidable salvage operation within the history and experience of the port.

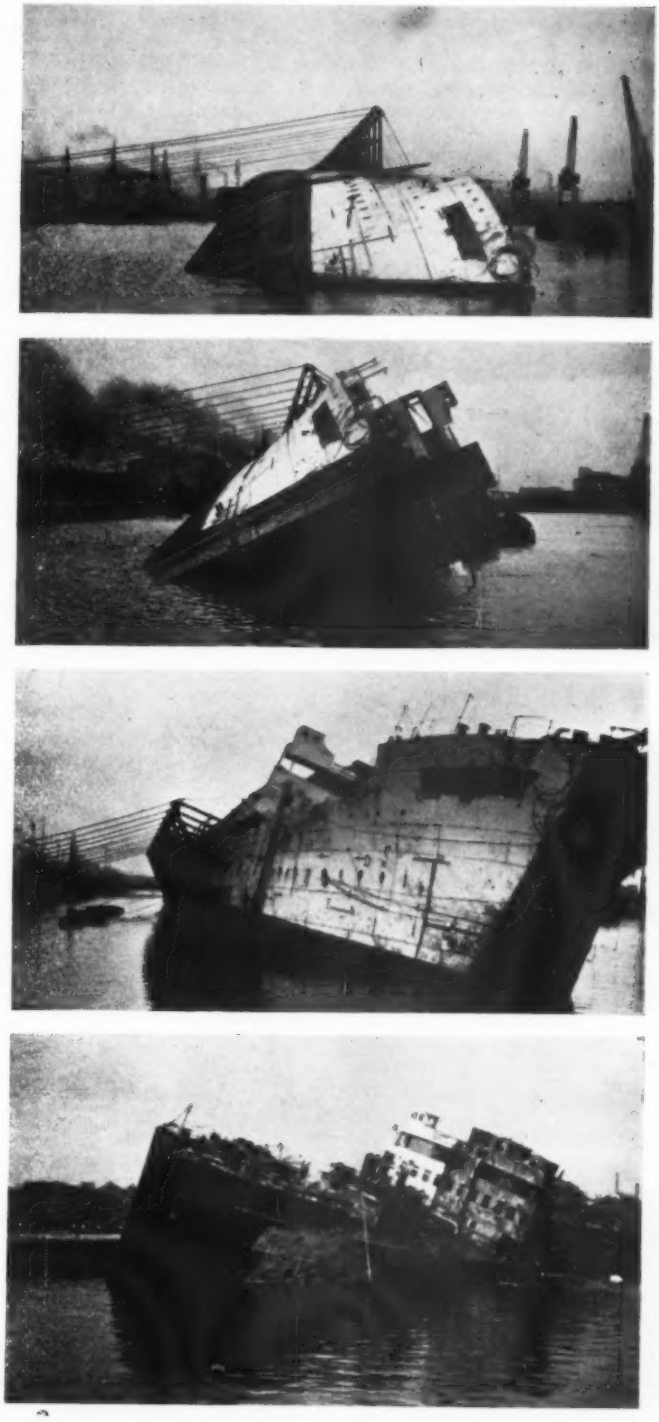
Several such types of casualty have previously occurred within the port, from either accident or "action of the King's enemies," but never before of such magnitude. In spite of all precautions on the part of dock authorities and all those engaged in the necessary and manifold activities connected with a vessel in dock, a certain number of ship fires of lesser extent frequently occur. In the greater number of cases, however, these are rapidly brought under control and extinguished by the prompt measures of the fire fighting amenities readily available before being able to assume a state of conflagration with resultant loss of vessel either by "gutting" or capsizing.

In all cases of fires where it is apparent that these are likely to assume major proportions, the senior port officials responsible for their respective special duties connected with such emergencies, are quickly on the spot and maintain a watching brief on the extent of the activities of all engaged upon the casualty, with especial reference to curtailing any undue amount of influx of water into the vessel, to so imperil her stability, with resultant risk of capsizing. This occasionally causes an extremely delicate situation between these officials and the operative Fire Authority as to the decision to discontinue further endeavours to subdue the fire and allow the vessel to burn out, with the elimination of risk of capsizing; or, continue efforts with the possibility of future and extended salvage operations if the risk becomes a reality. Naturally, such a decision is also largely influenced by reference to the danger to adjacent property, if the fire is allowed to become uncontrollable.

This decision then, becomes a momentous one, and carries an immense amount of responsibility and experience in judgment, and constitutes one of the most serious responsibilities of the Port Official. His decision is liable to receive protest from the Fire Authority and he is left to "hold the baby" in any subsequent recriminations. In such cases it is a great temptation to continue pouring hundreds of tons of loose water into the vessel in the hope of subjugation of the fire, but the first sign of "listing" is a sure sign of instability, which rapidly occurs, and increases, with the continued influx of water, and unless this is discontinued the vessel becomes liable to capsize. It thus becomes a divergence of opinion as between the natural desires on the one hand to extinguish the fire at all costs and the "long term" possible consequences of such policy in relation to extended operations thereafter. In any case, however, it may be considered that the vessel has become a constructive total loss as resulting from fire or submergence.

In planning the salvage of such a vessel as the *Empress of Canada*, an immense amount of "paper work" becomes primarily necessary and before any serious salvage operations are begun. In the first place the actual method to be employed becomes the main consideration and in ordinary cases of this type of salvage and with regard to vessels of this size, the methods available become limited in choice. They are:—

(1) Raising the vessel to an upright position by application of direct power, i.e. "parbuckling";
(2) by applying internal buoyancy to the vessel, i.e. by pumping and compressed air;
(3) by combination of the above.



Uprighting a Vessel by Parbuckling Wires and Tripods. (No. 1 top) Wires hove taut—commencing to heave. (No. 2) Vessel rising. (No. 3) Vessel at final position—19 deg. (No. 4 Bottom) Vessel uprighted sufficiently for final operations of pumping, etc.

In the case of the *Empress of Canada*, or a vessel of such size, it will probably be necessary to adopt (3) as it would prove impracticable to apply the amount of power as requisite in (1), and equally difficult to supply bouyancy in sufficient spaces as available for such in so complicated an object as a passenger vessel of this size. It therefore becomes the primary object of the salvor to determine by calculations the total amount of power necessary, as combined with that of the available buoyancy, to upright the vessel. Following these calculations are others involving the size and extent of all the complicated units of a salvage plant as essential for such an operation.

Port Marine Salvage—continued

Concurrent with these computations the first active steps in the general salvage operation consists of the clearance of all debris from the vessel, i.e. masts, funnels, davits, etc., and all other tophamper as liable to foul or interfere with later operations. All above water obstructions will be removed by cranes, etc., in conjunction with working-parties and those underwater will be worked at by divers. All this work, in itself, will occupy a considerable extent of time. Then, too, a careful survey will be made of the dock bottom in the vicinity of the vessel, with a view to its effect from any possible appreciable gradients upon the operation of uprighting. The vessel can also be " encouraged " to roll over, by the dredging of a trench beneath the submerged bilge. The possibility of effecting this, however, depends upon the nature of the bottom.

After the completion of this stage of operations, together with that of the " paper work," it becomes the hazardous task of divers to " seal " up the vessel's compartments as marked for the addition of buoyancy. There will, of course, be situated in the underside portion of the vessel to assist uprighting. This work entails the utmost care on the part of the divers, as a single fault in the effective " sealing " of a compartment might negative the success of the entire operation of salvage. During the course of the above preliminary operations progress will be made with the erection of a suitable number and type of steam winches on the opposite quay. These require to be firmly embedded in foundations of concrete. In certain cases it may be necessary for these to be set up within the adjacent sheds which must be kept clear for the purpose. The complementary boilers, fuel water tanks, etc., must also be sited nearto. The " pulling " power, as assisting the buoyancy power in the uprighting of the vessel, is applied in a form termed " parbuckling." In explanation of this term, a common example is that of a beer barrel being rolled up a slope into the rear of a lorry by means of the bight of a rope. When possible in uprighting a small vessel, the parbuckling wires are attached to the upper side of the vessel, passed around and beneath her and attached to the instrument or power for uprighting.

In the case of the *Empress of Canada*, however, such an operation would be impossible, and in order to gain the necessary leverage recourse must be made to tripods. These are usually of steel and of sufficient number and strength and capable of bearing the estimated weight to be placed upon each, and are erected upon the exposed (upper) side of the vessel. The parbuckling wires which are made fast to the underside of the vessel, are led to the tripods and from thence the connection to the winches is made by heavy purchases. The wires are of special flexible steel of 9-in. circumference and capable of a strain of 300 tons. The winch purchases are each capable of exerting 100 tons power. The correct attachment and spacing of these wires relative to the alignment of tripods and winches, constitutes in itself an operation of considerable effort and exactitude, especially upon the part of the divers engaged upon the underwater part of this work.

The next step is the assembly of plant upon the quay, adjacent to the vessel, comprising a large number of pumps of varying sizes, air compressors and the host of components to a salvage equipment. The various suction pipes of the pumps and/or the compressed air pipes must be accurately placed in their respective compartments in the vessel and their " entries " effectively sealed.

At the time of the final uprighting the offical in charge must be in a position to accurately and instantaneously effect control of all steps in connection with the operation. For this purpose a control position is established in a suitable location for uninterrupted observance of all points, with telephone connections to all his assistants in charge of their respective widely spaced spheres of activities. As soon as the pumping and compressed air operations are completed, the winches will simultaneously heave on the purchases, taking care to take equal strains and if the preliminary calculations are correct, the vessel will slowly commence to rise and this movement will gradually accelerate until the vessel assumes her final position, which will usually be found to stabilise itself at about 20° from the vertical or upright position.

The above completes the first operation of salvage and there now remains the finale of floating. For this purpose it is necessary to remove sufficient water from the vessel to restore flotation buoyancy and calculations should already have been made as to draft and trim. During this latter operation it is essential for as much loose water as possible to be removed prior to actual refloating as the vessel in such circumstances is usually in a " tender " condition and liable to list owing to the additional weight in the form of mud, etc., shipped whilst lying on her side as inherent to all dock bottoms.

In certain cases where a tendency to unusual tenderness is anticipated, some assistance towards increased stability may be supplied in the form of attached " camels " made fast alongside the vessel. In this operation, too, stability is assisted, when necessary and possible, by regulation of the level of dock water to approximate to the draft of the vessel when refloating, so that in the event of unexpected listing her bilge would at once take the ground.

The final operation of salvage consists of the removal of the vessel to either the repair or breaking-up berth—and usually the latter.

Such, in effect, is the type of problem which confronts the Mersey Docks and Harbour Board and their officials responsible for all salvage operations within the area of the Port of Liverpool. It is a well-known and oft quoted saying in salvage circles that " Each case presents its own particular problem," and therefore from this article it must not necessarily be assumed that the method of salvage as detailed above is applicable to the case of the *Empress of Canada*. In the absence of facts with regard to this individual case it is only possible to surmise the course of operations as likely to be used in connection with this vessel, as the result of many years' experience in port salvage. It is impossible, too, to convey in an article of this length, an idea of the multiplicity of details as involved in a salvage operation of such magnitude. It entails weeks of patient and careful consideration and calculation, backed by years of practical experience and involving months of planned and laborious work, demanding the utmost in both mental and physical effort, from all concerned.

That success will eventually materialise is assured and it is to be hoped that sufficient credit will then accrue to the competent salvage staff of the Mersey Docks and Harbour Board, who will thereby have accomplished one of the greatest feats in the history of port salvage.

American Methods of Port Working

(continued from page 300)

towards harmony. American organised labour is not work shy and is keen for innovation and, in the individual, enthusiastic in trying out new machines and methods. The employer too, more often than not, is enthusiastic in getting things done and handles his administration with common sense, patience, and quick apprehension, cutting out tendencies that may lead to trouble before they become critical, in other words, attempting to avoid a sense of frustration.

He points out that the inexpert foreman or manager, particularly the driving type, causes much misunderstanding and the one most to blame is his employer. This really means that trouble travels down the line from the head to the ganger, or charge-hand, and if the direction is judicious, weak, or brutal, it will be reflected at the bottom level.

Generally the outlook in America is less conservative than in older nations and industrial, commercial and financial progress has been phenomenal. Is it any wonder then that all are students of Success: imbued with the self-same urge as the " Forty-niners "; the flotsam and jetsam are the unfortunates who cannot make the pace or as in " 49 " are too rebellious to team up.

There is another telling point regarding will to work hard which it would be difficult for the Professor to appreciate. A large recruitment of the dockers comes from penurious and underfed Europe. Imagine then the feelings of a worker lucky enough to earn 2 dollars per hour for 44 or more hours per week. In English currency the wage packet (gross) would be at least £30 weekly, which goes a long way to lighten labour, no matter the cost of living, since, with a thrifty man, the savings will be proportionate.]

(To be continued)

LAND RECLAMATION FOR INDUSTRY

Another large contract recently completed by this Company was the reclamation of marshes on the Isle of Grain alongside the River Medway on behalf of the Anglo-Iranian Oil Company Ltd. (in conjunction with Messrs. Mears Bros. (Contractors) Ltd.). Over 900,000 cubic yards of sand were dredged and pumped ashore on to the marshes at the site of the new Kent Oil Refinery.

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The Handling and Stowage of Cargo

Some French Views on Modern Technique

DURING the 1952 Session of the Association Technique Maritime et Aéronautique which was held in Paris, five papers dealing with cargo handling technique and ship design were presented. Two of them, which are reproduced below, have been translated from the French and are reprinted by kind permission of the Association. The remaining three papers are of more direct interest to naval architects than to port officials.

Mechanical Handling Methods on Board of Vessels

By Commander P. GAROCHE
Merchant Marine Consultant.

In a preceding paper (Session 1951) I have already treated of the importance of cargo-handling in the exploitation of a vessel and indicated the solutions that should be useful to apply to obtain a better output. This study relates more especially to the improvements that could be carried out in the design of a vessel itself with the view of making it better adapted to the exigencies of new techniques already manifesting themselves.

The importance of the subject and its urgency are such that to-day cargo-handling is moving clearly towards the employment of means destined to utilise more efficiently the vessel of conventional type and it is probable because of this that the evolution of the construction shall suffice for the moment to follow the needs of that tendency: in other words, the construction of present-day vessels will be adapted to meet the needs of the current situation awaiting the realisation of new important developments of design. Without doubt some vessels of highly specialised design have already been constructed to satisfy particular needs of certain traffic; yet there still exists wide possibilities for the cargo ship, in the present conception when lightly modified, to adapt it to the exigencies of new methods and modern means of producing increased and more economical outputs.

I shall therefore show some realisation of a practical order inspired by these new means and needs which manifest themselves, and of which the application to existing ships show themselves to be possible solutions of problems of serious import which have confronted the Maritime Industry for some years.

SOME RECENT EXAMPLES SHOWING THE POSSIBILITIES OF CERTAIN METHODS OF CARGO-HANDLING.

The normal evolution of industrial methods show more and more the reliance on the use of mechanical means to increase the output of human labour, and it is perhaps due to the delay in accepting this fact that the handling of the merchandise aboard vessels has proved a serious handicap to maritime interests. No means of transport is more economical than a vessel, and yet one sees it everywhere almost excluded by the competition when other means can be utilised. For example, the national coasting trade is gradually disappearing in nearly all countries possessing railways and good roades. To ensure that a vessel can carry goods cheaper than other forms of transport, it becomes necessary to handle large quantities at the one time, and since all the time passed in port represents time lost in transporting, the necessity of rapid port operations is imperative.

Last January, I witnessed two experiments of cargo-handling which were carried out with the view of testing the use of large containers loaded in Algiers and discharged in Marseilles. There was also the need for developing the best technique of handling in the ports to save time and cost. These experiments were initiated by the Compagnie Nationale des Cadres who had obtained the co-operation of the principal interests and, in particular, of Shipowners assuring a regular service of importance in early vegetables for Mediterranean ports. The following table shows the time realised on board the vessel *Charles-Leborgne* on January 12th, 1952, at Marseilles with one gang.

The containers were each 3.2 tons weight stowed in No. 3 hold, some on the floor of the hold and some in the 'tween decks on the hatch. The handling was effected with the aid of a steam crane of variable radius delivering each container directly on wagons drawn up on quayside. Each gang was made up of 4 men in the hold, 4 men in the wagon, 1 foreman, and 1 crane driver.

Output Statistics.

The time taken to handle each container was recorded as follows:

Order of operation	Time of pick-up	Position on board	Order of operation	Time of pick-up	Position on board
1	14h 37	On 'tween deck hatch	11	15h 09	do.
			12	15h 12	do.
2	14h 40	do.	13	15h 16	do.
3	14h 43.5	do.	14	15h 19	In hold, at sides
4	14h 46.5	do.	15	15h 23	do.
5	14h 50	In hold, under hatch area	16	15h 26.5	do.
			17	15h 30	do.
6	14h 53.5	do.	18	15h 37	do.
7	14h 56.5	do.	19	15h 37	do.
8	14h 59.5	do.	20	15h 40.5	do.
9	15h 03	do.	Unloading completed	15h 42	
10	15h 06	do.			

Which gives an output of 20 x 3.2 x 60/65 = 59.1 tons per hour.

Another experiment at Port-Vendres on board s.s. *Touggart* on January 31st in very different conditions, when the ship's derricks were used to load into lorries, has demonstrated that with a little competent direction it was possible to attain very satisfactory results. The figures obtained at Marseilles shows an output almost four times that obtained in this port by the accustomed methods, and it is on this fact that one must ponder.

Taking the normal loading of regular lines calling at these ports at a maximum of 200 containers, then the time of handling will be on the basis of the above figures

65 x 200 / 20 for 1 gang

or of

65 x 200 / 20 x 4 = 2h. 42m. for 4 gangs

Then the operations of unloading and loading could be achieved in less than 6 hours at each call, which would permit of a round trip of the vessel in 4 days instead of in 7 at the present time.

For the vessel's management a container represents a cargo-tray or pallet landing board, all prepared and of considerable weight. Any other disposition giving the same advantages would be difficult to devise. All other means of arranging the goods in a single heavy parcel would give satisfaction on the condition that the problem of stowing were also solved. It is possible to imagine, for example, the assembly of a certain number of pallets of ordinary type to form an element to take a heavy load. The container, however, has the advantage of holding all the smaller articles together; nevertheless, it is possible to foresee an arrangement applying practically to all the small stuff that one might load on pallets.

It should be mentioned that during the experiments it has been able to check that the rapidity of the operations was due mainly to the fact that most of the containers were placed in the holds in positions easy to couple up with the slings, that is, clustered almost immediately under the hatch area. In the case of a full cargo the manner of shifting of the separate containers stowed to the sides out of plumb of the slings yet requires a solution; particularly those placed in the 'tween decks, and in the second tier in the hold.

On the s.s. *Touggart*, for example, in which a certain number of containers were on the second tier, the shifting to the hatch plumb was carried out by crow-bar sliding, an arduous method, subject to grave risks to material and personnel. Actually it took 10 minutes to inch the containers to sling position. In cases like these it seems absolutely necessary to furnish vessels with mechanical aid for horizontal transport aboard to bring the goods plumb into the hatch area.

The Handling and Stowage of Cargo—continued

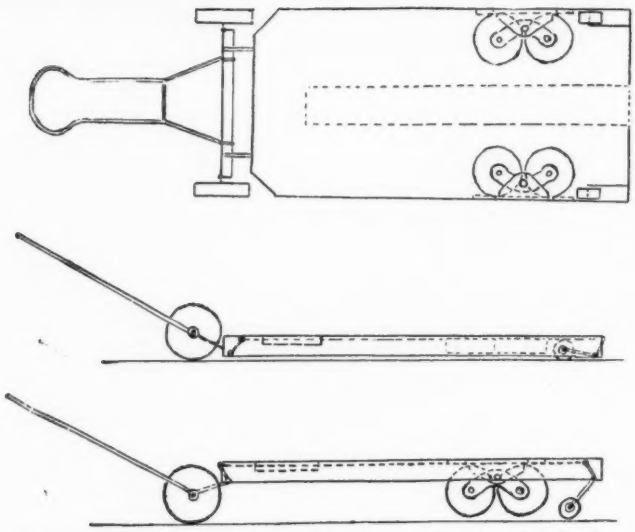

Fig. 1 (top). Plan of the trolley. (Centre). Trolley in lowered position to pass beneath the load. (Bottom). Raised position of trolley allowing collapsed rear wheels to take vertical running position.

A Suggested Solution.

The needs for stowage on a vessel and the customs of labour do not favour other means of stacking than tier upon tier. Also the fork-lift truck largely used nowadays on shore does not accommodate itself too readily to the requirements of a confined space like a ship's hold, mainly on account of the lack of space to manœuvre easily. It is preferable that the means employed on board should be that which will follow the traditional methods of stowage of one layer of goods upon another so that there may be established security in place such as has been customary for many decades of sea-going cargo craft.

The trolley, or chariot, described below, has been especially designed for this purpose. Originally it was conceived for the handling of containers, but its principle is equally applicable to palleted goods, and also to stacked cargo-trays provided the platform is constructed to allow of depositing and picking-up easily.

This suggested apparatus comprises two qualities apparently contradictory: (1) The vertical height of the lifting portion must be as low as possible to allow of its insertion under the loads to be transported. (2) The diameter of the carrying wheels must be as large as possible to secure an easy movement over all surfaces, even those which have appreciable projections or possess little supporting power. In any case the trolley should be able to run on a normal surface such as the floor of the hold or over the 'tween decks, and also to be able to run in tracks formed of two channels or bulb angles, spaced apart, and to negotiate a ramp such as would be necessary to mount coaming of hatch or to a higher level on the top of the first layer in the hold. It should also be able to run over the shore apron or sheds floors if required.

Description and Use of Apparatus.

To respond to the conditions enumerated above, the trolley must comprise a platform or tray supported at one extremity by a pair of leading wheels of large diameter, and at the other by two retractable rollers housed almost completely in the depth of the platform chassis. The wheel and the roller placed at each side of the platform must be in the same alignment parallel to the longitudinal axis and equi-distant from it so that they may follow a uniform track. The wheels and the rollers are articulated on the platform chassis and are operated by a system of lever arms which allows them to be used more or less as lifting jacks. In the raised position the supporting wheels which are housed (collapsed) within the thickness of the chassis in a horizontal position are levered into the vertical position for transport of the load. (See Figs. 1 and 2.)

Tests have shown that to operate a trolley by hand with normal size wheels, one man per ton of load is necessary on a good horizontal surface, and four men are ample for ordinary conditions of operation of this machine.

The control of the leading wheels allows all necessary manœuvres for the placing of a tray to be carried out easily. A container with a 4-ton load can be carried to the furtherest part of the hold from the centre of the hatch by four men comfortably in less than one minute. If the ground surface is not in good order, as say an old quay wall apron, it is convenient to use a portable track, as already mentioned above. After placing a first layer of cases completely over the floor of the hold, a portable track will in many cases be necessary to carry on with the placing of the goods over the first layer. In special cases the containers comprise fittings on the top-sides to facilitate the security of stowing and when those project above the common surface the portable track comes in useful.

It is preferable to envisage stowage which leads to movements following the longitudinal and transversal axes of the compartments, that is to say the transport shall take place first along the axis of the vessel and then a transverse movement to the side to place in final position or first a transverse movement followed by one along the axis of the vessel.

Where there are projecting coamings at the 'tween deck hatches ramps can be formed with the portable tracks. Regarding these portable tracks, to avoid cumbersome and heavy elements their lengths should be limited, and the weights of the rolled sections used should be as low as possible to give the adequate strength. When used as ramps they should be supported at close intervals to avoid over-stressing.

Application to Palleted Goods.

As already remarked, this apparatus was primarily designed for use with containers but it will also be found useful for palleted goods and for bundled or baled goods usually shipped on platforms or cargo-trays. In the latter case considering the work on board of the vessel only, the platform can be picked up on the trolley on the floor of the hold and deposited in the hold where required. It is evident that this method would apply satisfactorily to boxes or sacks packed on platforms, or pallets.

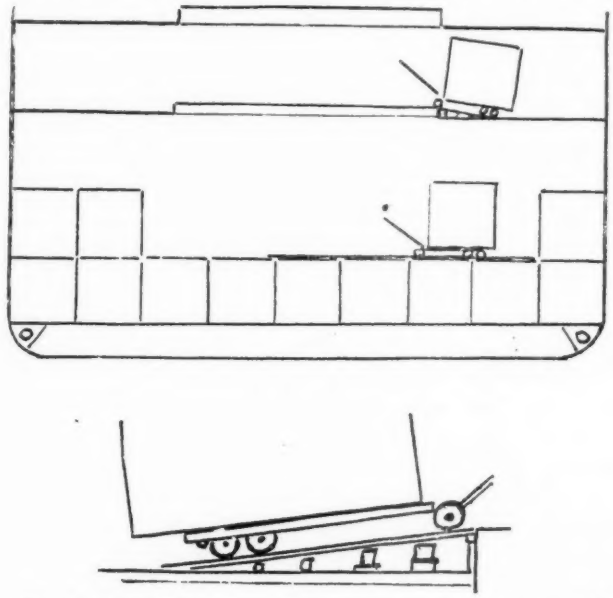

Fig. 2 (top). Examples of movement aboard vessel on second layer of containers in hold and negotiating 'tween deck hatch coaming. (Bottom) Trolley on ramp at 'tween deck coaming showing necessity of close spacing of track supports.

Importance of the Weight of the Cargo-Tray.

An important element of production is represented by the weight handled on a carge-tray or platform. It is agreed that the container possesses advantages in this respect on account of the relative high load handled at the one time. There is therefore no reason why the loads of the cargo-tray should not be increased to the capacity of the trolley in the one sling. Putting, say, 20 sacks on a platform in place of, say, a usual 10, the actual pro-

The Handling and Stowage of Cargo—continued

duction is doubled without imposing extra labour in the hold since the mechanical aid of the trolley facilitates the stowage, and a conventional type of vessel has by this means advantages equivalent to that of a more modern type of vessel of highly specialised design.

Even in the most modern of present-day cargo vessels with large hatches there is almost three-quarters of the hold volume out of plumb of the hatch area and therefore requiring man-handling of the goods to the wings of the holds. From the performances of small trolleys handling containers on the floor of the hold only, it was proved that one machine sufficed to place 20 containers per hour without difficulty.

We are convinced that with trolleys such as we have described, or with variations of the principle, much improvement of cargo-handling will result for the benefit of all concerned.

Port Operating and the Human Element

By TRISTAN VIELJEUX
Managing Director, Societe Navale Delmas-Vieljeux.

The Association last year discussed at some length the important subject of cargo-handling and suggested means of improvement by the application of new technique and more modern machinery: Mr. Detanger was concerned with the grouping of small packages using pallets and containers, Mr. Vincenti dealt with the use of mobile engines, tractors and fork lifts, and Commander Garoche applied his competent maritime experience to improvement of appliances aboard ship. As a shipowner, the three papers were of great interest and I therefore distributed several copies of them among the captains of my Company's vessels and our agents in various ports, asking them for frank comments. From this joint effort I have the following remarks to make.

The suggested remedies do not appear to me to be sufficiently efficacious for the saving of time or overall cost. The economical use of pallets and containers is restricted to certain traffic, and the improvement of horizontal transport in holds by the use of runways under the decks has many disadvantages; they take up valuable space and are not efficient. We fitted up one of our vessels, the S.S. *Medea* with a runway system and very seldom indeed did the dockers use it. Before we had it taken out we found that, with certain important cargoes of barrels or logs of timber, too much space was lost. The solution we seek is not yet found. Commander Garoche* suggested that the solution was to suppress the need for horizontal transport and offers the following means to achieve it:

(1) Increase the number of hatches

(2) Provide uniformity of compartments

(3) Equip vessels with cranes of variable range.

Without under-estimating these suggestions let us examine them.

An increase in numbers of the hatches, or even of their area, would in certain cases give a more easy manipulation, but the rational use of the 'tween decks would then be compromised. In effect, the principal use of the 'tween decks is to permit an easy classification or grouping of cargo; in other words, they are like sorting boxes allowing access to parcels of goods destined to one port without disturbing those goods for another. If the area of the hatches is increased the 'tween deck space will be reduced in proportion to the added area, unless the hatch is partially opened, only the goods stowed in the side decks will be accessible at the port. The goods stowed on the hatches must be discharged at the first port of call. On vessels loading in several ports goods destined for other ports, which is the general case, it is indispensable to be able to dispose of an important volume of side space. Furthermore, the 'tween decks are used for packages which cannot go into holds, and to increase the surface of hatches decreases the surface of decks usable for the last ports of call.

(2) To permit the use of forks it would be necessary to have the hatches as near deck level as possible but this would have the disadvantage of diminishing the security of personnel. It would also reduce the strength of the deck by the reduction of coamings. On the whole it appears that all the suggestions so far formulated can be used only for traffic in small tonnages only and where the number of ports of loading and unloading are limited.

It is apparent from the information supplied that the post-war methods of cargo handling and the introduction of modern mechanical aids have not succeeded in halting the slowing down of output. In view of this, one asks oneself, would it not be better to hold on to the old methods. However, we are not of that opinion, even as Commander Garoche has said, cargo handling represents 30 per cent. of the expenses of the exploitation of ships commercially, and that two-thirds of the time a vessel is immobilised in port. Against this there is little comfort in the fact that in the time of sail a 3,000 tons cargo of nitrate unloaded by manual labour had an output per hatch (gang) almost double that of the present day. Since those days there has been considerable progress in equipment and it is beyond doubt that, had the potential of manual labour been maintained, even with the great improvement of conditions of work, the output should also have improved or at the worst maintained itself.

We are therefore led to make some observations on these matters and attempt to make a few suggestions without claiming that our point of view is the only or the best solution.

(1) We are convinced that the problem is not technical, it is social. If one would only admit that the white, black or yellow man of 1952 does not like or even refuses to carry, draw or push, then it follows that where the man fails in his task the work must be done by machine. The search for the best machine has preoccupied the technician of cargo handling but to our knowledge no one has yet considered the human problem in sufficient detail before concentrating on mechanical aids. Now if the machine replaces muscle automatically then the driver who manipulates it must replace the manœuvre. A conception that is admissible is that of the docker who is engaged for half a day, without any specialist training whatsoever, and whose muscle only is usefully valuable, refuses and always will refuse more and more to make full use of his only credit. Which is the industry, even the most modern, which could achieve a good output by manœuvres only? These men who feel themselves menaced by unemployment in the future seek, conscientiously or otherwise, to limit their output by

(a) fixing all standards of output as low as possible.

(b) limiting at low level all net and pallet loads.

(c) lowering the amount of effective work by the diminution of the hours worked each day.

(d) insisting on the maintenance of numbers in a gang even if the work is newly mechanised, and exacting the limitation of the number of dockers per port.

When we can have workers of the port industry engaged by the week or the month capable of working not in gangs but in a *team* and using to the best advantage the machinery provided for them by the port, or the employer, then we think the outputs will be considerably improved.

(2) The second element in the order of importance which, to my way of thinking, upsets the speed of working is the general state of the goods as received for shipment. One is seriously preoccupied to-day with questions of the breaking up of freight, of the containers or of palletisation. The results are certainly interesting but we think that it is necessary to probe the problem of packing more deeply in co-operation with the manufacturer. Is it reasonable that each industrialist can choose to his own liking the packing of his goods and then present them for embarkation as cases of all forms, of all weights and sizes, of barrels which may be slung by hooks or may not, or of single pieces unpacked, of wood or of steel of all lengths in bulk, of heavy packages without hooks for slings, and so on. And all that without any difference in the freight charges which are fixed only on the nature of the goods, the weight, the volume and the destination.

The mechanisation of the operation on land and on board (trollies, lifts, fork-lifts, sling-platforms) require imperatively, in our view, the standardisation of parcels, and we do not see serious inconveniences in this. Why cannot the same case contain bottles of wine, liqueurs, tins of conserves, pots of mustard, or kilos of sugar. The adaptation of the manufacturers' packings

*Paper contributed by Commander Garoche in Session 1951.

The Handling and Stowage of Cargo—continued

would be made rapidly enough if the freight rate of the goods was fixed in proportion to the amount of handling required. We think that the shipowners should consider seriously quoting a basic freight rate which varies, say, by 20 per cent. plus and minus, in proportion to the bad or easy handling condition of the merchandise. It follows that in acting together in this way they would be able to insist on the manufacturer providing correct packing to facilitate and accelerate cargo handling and so reduce the costs and the loss of volume in stowing. If one cared to compute the really unnecessary time lost by vessels in stowing a veritable bric-a-brac of dissimilar objects, one would probably be convinced that the loss that might be incurred by the shipowner in a reduction of his freight rate for good packing, would in the long run prove a good investment.

(3) The vessel with its particular characteristics appears to me to always constitute in the decreasing order of importance the third element governing the efficiency of cargo-handling operations. It must be admitted that important modifications are difficult to realise in this direction. The best one can do is to compromise and fashion the arrangement of a vessel on the conditions current at the immediate time as conceived by the shipowners and naval architects. It is not disputed that one can try to reckon what the future will bring, but commercially it seems such maturity is far from the day of construction of large cargo vessels of various forms with eight or ten hatches, retractable upper decks, and probably with a central bulkhead with the holds to port and starboard.

(4) Finally the port and its equipment represents, in our view, the fourth and last aspect of the question of cargo-handling. It is not by simple originality that we give the last place to that which is generally considered as the principal element of the problem.

To justify ourselves we shall cite the examples given by our agent at Bordeaux who records that in the 25 years that he has been occupied in cargo-handling in the port, the equipment has been constantly improved but the output has considerably diminished: in 1928 he loaded vessels for the West African Coast at the daily rate of 200 tons per hatch with old steam cranes. In 1952 with a modern installation only 100 tons is a very good average. Whilst I would agree that port equipment is essential for bulk shipments, for mixed merchandise I do not consider it necessary. To pretend that one works as well everywhere is nonsense, but to believe that well equipped sheds and expensive modern cranes constitute a sure means to speed up the cargo-handling operations is equally open to doubt. Before the war, in Algiers, cargo-handling by the use of vessels' derricks and deck winches was as rapid as that in many Continental ports over-equipped with expensive electric cranes.

To speed up the work of a port it is necessary to have

(a) moorings in calm water at constant level: tidal rise and fall is a serious handicap.

(b) large areas of sidings and of sheds as close to the vessel's berth as possible allowing of the assembly of all the cargo.

(c) means of rapid despatch or distribution by river, road, or rail. Bottlenecks of transport in a port are worse than any absence of equipment.

(d) lifting gear, transporters, are, in my opinion, superior to cranes of rotation balancing their loads, a matter which is a cause of delay. In factories transporters or aerial runways are in practice preferred to cranes; then why not in port works?

These various reflections do not pretend to resolve the whole of the particularly complex problems of handling cargo. They are put forward for the purpose of showing a point of view of an owner of vessels having the desire to use them to the best advantage.

Foreign Publications Received

" Schiff und Hafen," Hamburg. This German technical journal already in its fourth year of issue has kept up its high standard of printing production and its selection of interesting articles relating to ships and harbours. During 1952 a large number of contributions from the pens of experts dealt with the important matters of ship construction and equipment to fit in with the present day needs. The December issue contained several articles of immediate interest; the use of light metal alloys in ship construction; an able study of ship roll period relative to wave period in which the author, Dr. Otto Hebecker demonstrates a form of evaluation deduced from actual records. There is also a topical article descriptive of the modern trend of cargo vessel construction with ample mechanical aids to reduce port labour to a minimum. In particular the article deals with the motor cargo vessel " Ciandra " built by Fr. Lurssen Werft, Bremen, for the German firm Translanta-Reederei, Rendsburg (Fig. 1).

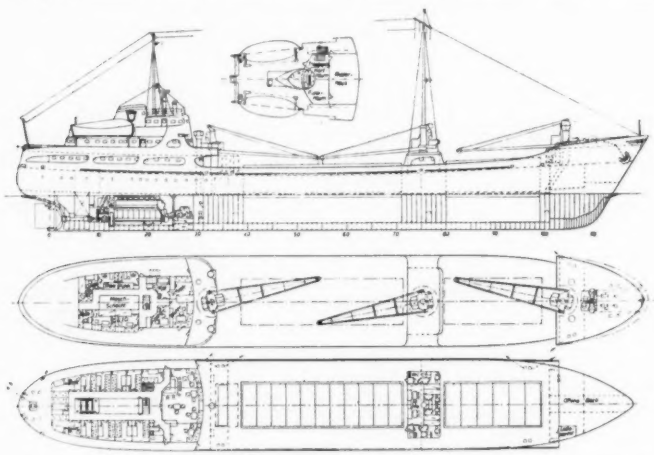

Fig. 1 (top). Motor cargo-vessel " Ciandra." (Middle). Plan of poop deck. (Bottom). Plan of top deck.

The several features of interest are:

(1) The engines, fuel, accommodation and bridge are all situated aft. The whole of the vessel space, with the exception of the fore peak, forward of the bridge is given over to cargo holds of clear span.

(2) The hatches of which there are only two on the upper deck are almost the full length of the holds and are provided with steel hatch covers supported on side runways at the fore and aft coamings. This arrangement allows the hatch leaves to be drawn and stacked mechanically at the ends of the hatches.

(3) There are three powerful electric cranes with jibs of variable radius placed on the axis of the vessel, as shown in plan. These cranes cover the whole of the hatch areas.

(4) Length of vessel 250-ft.; beam 37-ft.; cargo space 1,550 tons at 65 cu. ft./ton or 460 standards of timber; speed of vessel 12 knots (normal).

" Hansa," Hamburg. This old established and prominent technical journal is published weekly and provides comprehensive information concerning ship construction in Germany. It also includes articles covering many aspects of commercial port operation, navigation aids, harbours, etc. During the past year it has gradually developed into the weighty volumes of pre-war years.

" Polytechnisch Tijdschrift," Haarlem. This Dutch fortnightly technical review is one of the most interesting and entertaining. Its range is extensive, it covers the whole field of civil engineering in the broader sense, defined by Vernon Harcourt as that activity of man which harnesses " natural forces for the use and benefit of man." More than that, unlike many other journals covering an almost similar field, it extends its interest to art in construction—namely architecture of merit. Over the past year its pages were replete with most important and original articles by experts on the many subjects and problems encountered in this wide field. In particular, as one may expect, many valuable contributions were given on coast works, protective and progressive, and town planning.

Dredging at Ridham Dock

Successful Experiment with Specially Designed Dredger

By A. M. M. GLASIER.

Situated on the mainland of Kent about three-quarters of a mile south-east of King's Ferry Bridge, which spans the Swale and connects the Isle of Sheppey with the mainland, is a private seaport known as Ridham Dock.

The dock belongs to Bowater's Lloyd Pulp and Paper Mills Limited and handles all shipping carrying raw materials to the Bowater Paper Corporation's two mills at Kemsley and Sittingbourne. These cargoes, which total 60,000—70,000 tons per month, consist of woodpulp, pulpwood (logs), coal, and china clay. For handling them the dock is equipped with eight movable electric level-luffing cranes, adjacent, to which is a 2½ mile long ropeway for conveying the logs to a storage site near Kemsley mill holding some 70,000 fathoms of wood.

During the season from May-November a very substantial quantity of pulpwood is imported from Newfoundland, mainly by chartered Scandinavian vessels, and it is not unusual during this period for the number of vessels handled monthly to be well over 30. This lends the dock special interest as it is one of the very few ports, if not the only one, in England to land this commodity in large quantities. As well as ocean-going vessels, a considerable amount of traffic is dealt with in the form of dumb barges used to convey newsprint to the London docks and wharves for export and use by the national newspapers.

Normally the dock is approached by way of Sheerness harbour and thence through Queensborough and the West Swale. Although the dock itself is capable of receiving larger vessels, three factors prescribe that they are not generally larger than 4,500 tons deadweight. Length is restricted to 315-ft. by the sharp winding bends in the Swale fairway and beam to 44-ft. by the King's Ferry bridge span, which has to lift to allow vessels to pass. Draft is limited to 20-ft.

Larger vessels almost without exception are assisted by tug, especially at the entrance to the dock, since, owing to its direction relative to the fairway, a turn of about 90° to starboard has to be made, the manœuvre being complicated by a flood tide with a rate varying from three to four knots.

The dock is tidal and, being bounded on three sides by cement walls, resembles in many respects a dry dock, except of course that it has no lock gates. Its approximate dimensions are: head, 130-ft.; east wall, 750-ft.; west wall, 850-ft.; and width at entrance, 250-ft. The tidal range is: high water, normal spring tide, 29-ft.; low water, normal spring tide, 12½-ft.; high water, neap tide, 27½-ft.; and low water, neap tide, 14½-ft.

The Siltation Problem

On account of its situation relative to the main flow of the tide, the dock suffers a quite appreciable amount of siltation, generally necessitating some 15,000—20,000 cu. yards being dredged every three to four years. The siltation is primarily caused by the fast running current meeting the longer side of the dock wall and eddying the silt in suspension so that it builds up at two points about one-third down the length of both walls, the inward movement of vessels tending to spread it in two lines parallel to these walls and down their entire length to the head of the dock. Furthermore, many of the bigger vessels have to drop anchor in midstream as they turn into the dock, which often has to be shot at speed on account of the current, and therefore tend to drag silt into the centre of the dock as they enter. The displacement of the ships moored at the dock walls has the effect of spreading the silt carried in by the tide outwards towards the centre of the dock and also inwards closer to the dock walls. It follows, therefore, that the points of greatest siltation are at the centre of the dock, towards which soundings show it to rise in a kind of peak, and immediately alongside the dock walls.

Because of the volume of shipping using the dock, however, the major problem was not how to deal with the siltation, but how to deal with it without interrupting the shipping cycle. It has been solved by the use of a specially designed suction dredger with flexible couplings to pump the sludge by overland pipeline to an excavated lagoon adjacent to the dock.

Aerial View of Ridham Dock.

The Dredger

The dredger is a 99-ton swim-ended barge, the *Avenger*, having a length of 90-ft. and a beam of 20-ft. She was originally used for the transportation of paper to the London docks and later for the conveyance of china clay to the Sittingbourne mill. A cabin has been erected amidships, housing the pump. It is a self-contained unchokable centrifugal pumping set capable of delivering 50,000 gallons of water head against a total head from all causes of 60-ft. It has a 6-in. flange suction fitted with a vacuum and pressure gauge, directly coupled by flexible coupling with a 40 b.h.p. radiator cooled, compression ignition, hand-started Ruston Diesel engine, complete with fuel tank, exhaust silencer, and air filter, the whole being mounted on a steel bed-plate. According to the suppliers the pump is capable, under reasonable conditions, of pumping 44 cu. yards of spoil per hour, assuming the actual solids to be 15%.

The suction pipe, which is fitted to the port side of the barge, reaches just aft of the bow when not in use, almost touching the waterline, and is raised and lowered by a 5 b.h.p. petrol motor operating a friction hoist controlled from a small superstructure in the bow. During dredging it is continuously raised and lowered in an arc of about 1 to 2-ft. so that the serated edge of the mouth of the suction pipe cuts physically into the silt. When the dredger was first used late in 1948 it was found that the percentage of solids recovered was low. To improve this a 3-in. diameter pipe reduced to 1-in. at the base and having two outlets was fitted to jet water at a pressure of 40 lbs. per sq. inch. This pipe is fitted directly under the suction pipe and jetting has been found instrumental, during the bringing of some 16,000 cu. yards of spoil to the surface, in raising the total solids to as high as 15% and in one case to 20%.

The dredgemaster is an engineer who has had experience in dredging, though not previously with a suction dredger, and he has a crew of three. The craft is positioned by means of two headlines and two sternlines operated by geared hand winches.

An improvement soon to be fitted to the dredger is a cathead over the bows, having a grab working in conjunction with the suction pipe. It will have a quick-release mechanism to drop spoil on to the surface of the water, thereby raising the total solids in suspension. This method has been tried by using one of the quayside cranes to drop sludge at the edges, where small quantities of coal dropped overside become compacted in the silt and thus resistant to jetting. It has proved effective in overcoming that problem and it is thought that it will prove equally effective when adapted to the dredger.

Disposal of Spoil

Round the quayside runs a series of 6-in. disused water pipes which lead to a 12-in. pipeline inclining towards the artificial lagoon, which lies about a quarter of a mile away from the east side of the dock. The quayside pipeline has connections at various points enabling it to be coupled with lengths of flexible pipeline,

Dredging at Ridham Harbour—continued

floated on oil drums, leading to the dredger. The small size of the dredger allows it to work easily among the berthed shipping and the multiplicity of connecting points means that it is always possible to obtain a connection even when the walls are almost completely occupied by ships. Furthermore, dredging can easily be interrupted and the flexible pipeline disconnected when ships are entering or leaving. Thus it is possible to carry out dredging almost continuously without any interruption to the shipping cycle and there is also the advantage that the dredger itself takes up very little space when berthed.

Conditions already prevailing adjacent to the dock have greatly assisted in the disposal of spoil. Before the ropeway carrying the pulpwood to Kemsley mill was installed, the pulpwood storage area was where the lagoon is now constructed. To support the tremendous weight of the wood on the marshy ground a reinforced bed of ashes and clay was laid down. This, incidentally, came to light when the area — about 11,000 cu. yards. — was excavated during the construction of the lagoon. The mixture was built into an artificial seawall some 15-ft. high extending also at a lower level round the other three sides of the lagoon, with a fifth artificial wall dividing it into two sections. It has been found to give an extremely good filtering medium, allowing the water, which drains down the fall of the land towards the Swale, to escape slowly and yet holding back any solids still in suspension, so that a totally clear effluent escapes into the Swale. The result is that a very even build-up of firm mud is being obtained over the whole area of the artificial lagoon.

The Bowater Paper Corporation do not claim that the result from this suction dredger is, judged solely from a dredging standpoint, quite as good as would be obtained from a normal bucket or grab dredger. They do feel, however, that it is more than adequate to overcome the degree of siltation encountered while at the same time entirely solving the major problem—the avoidance of any interference with the shipping cycle. Coupled with the interesting use of overland spoil disposal, their satisfactory solution to both problems should not be without encouragement to others who have similar difficulties to overcome.

Correspondence

To the Editor of *The Dock and Harbour Authority*.

Dear Sir,

Handling of Cargo

The echo which my article on " Handling of Cargo at European and U.S.A. Ports " has produced bears testimony to the considerable interest which this subject has found amongst many harbour experts. This corresponds to the hope I have cherished " that other harbour experts would contribute to a solution of the problem under discussion." Since in each individual country, even in each single port, the conditions to be considered are different it was to be expected that the conclusions I had drawn would certainly not be accepted in all quarters. I had therefore stated (page 91, July, 1952, issue) " that the comparison of the different methods does not admit a fair judgment of their relative merits."

My views were clearly referring to conditions in European ports. It is of the greatest value to know why different points of view stand in the foreground in non-European ports.

I would appreciate if I were allowed some remarks with regard to the interesting comments which have passed over the desk of the Editor in respect of this subject:

(1) Dr. Paul Liemdorfer, Stockholm, compares the costs of quayside cranes with those of the ship's level-luffing cranes. Crane prices will differ in the various producing countries. It would be well to depart from a standard type of quayside crane, i.e. one of 3 tons capacity with an outreach of 20m. Cranes of a considerably wider outreach and of 5 tons capacity, and possibly with appliances for the handling of bulk goods, would naturally shift the basis of calculation. According to German conditions it is not possible to assume the average price of a quayside crane to be three times that of a ship's luffing crane or that of a mobile crane. As a matter of fact, in this country costs are only 1½—2 times as high. In this case the cost of 5 quayside cranes is sufficient, besides covering the difference between 8 old-fashioned ship's gear and 8 modern ship's luffing cranes for procuring 4 mobile cranes only. This proves how difficult it is to find a generally valid basis. Besides, the cost of modernising the hoisting equipment of the ship and of reinforcing the ship's structural elements, possibly required in this case, are to be paid by the ship's owners who will take an interest in the cost of quayside equipment only if they are also the owners of the dock which generally is not the case.

Conditions in a port will seldom be so advantageous as mentioned by Dr. Liemdorfer in connection with the specialised facility for container ships in the coasting trade in Copenhagen which is well known to us.

The mobile crane will only assist the quayside crane under special harbour conditions, but will not replace it. Fundamentally, the mobile crane is at a disadvantage since it always has to carry about its own power supply.

The question of employing fork lift trucks ought to be separated from the question of using quayside cranes since fork lift trucks can be used to advantage in connection with both methods of cargo handling as I have tried to show on pages 40 and 41 of my article.

(2) I fully agree with Mr. L. W. Byrne. New York, that the merits of the different systems of cargo handling method are determined by the speed with which a ship is turned round. It will never be able to ascertain this speed by calculation; it will be determined by experience only. For this reason I set great store by the statements made by many foreign and German ships' captains and I have referred to their opinion (page 42) " that by the use of quayside cranes the handling output of a ship is increased as compared with the exclusive employment of ship's gear." In my opinion the captains are in the best position to judge the speed of cargo handling *as a whole*.

I furthermore agree with Mr. Byrne's statement that " it is unlikely that any terminal would want to experiment in face of the probability " of the labour element's reaction. The failure of such an experiment in a German port had been referred to on page 35 of my article.

(3) I have repeatedly mentioned that the natural differences between the various ports and the difference of conditions of work in ports and of port customs are too great as to permit any common rulings of general validity for the mechanical equipment of ports. The interesting statement by Mr. Roberts, Sydney, seems to prove this point. It is to be expected that in Sydney, as in other ports of the world, local conditions are in existence which do not allow the adoption of methods which have been found to suit European port conditions. So the very limited rail traffic in the docks, mentioned by the writer in Sydney, itself demands solutions completely different from those applied in the majority of European ports.

I look upon the problem of handling of cargo in ports as a task for genuine co-operation for which experience should be collected on an international basis. It should, however, not be expected to arrive at a uniform and patent solution applicable to all ports.

Yours very truly,

Hamburg-Volksdorf,
Eulenkrugstr. 98.
January 27th, 1953.

DR.-ING. HANS NEUMANN,
Baudirektor.

European Inland Transport in 1951.

The development in European inland transport during 1951 is reflected in the " Annual Bulletin of Transport Statistics " published recently in Geneva by the U.N. Economic Commission for Europe (E.C.E.). Rail-freight traffic in 13 western European countries was 15 per cent. higher in 1951 than in 1950; inland waterway traffic increased by 18 per cent.; whilst road freight traffic also appears to have increased in those countries for which figures are available. For the first time, inland waterway traffic in Belgium and France exceeded its pre-war level, and the density of traffic on inland waterways showed increases in 1951 over 1950 as follows: Belgium 1.6 per cent.; France 12.2 per cent.; Western Germany 25.1 per cent.; Netherlands 13.4 per cent.; and the United Kingdom 4 per cent. Rail-freight traffic figures for Bulgaria. Czechoslovakia, Hungary, Poland, Rumania, and the Soviet Union together show a 12 per cent. increase, and inland waterway traffic has also increased. The Bulletin, available through U.N. sales agents at 6s. sterling (Swiss fr. 3.00, U.S. $0.80), suggests that the increased share of transport in total economic activity apparent from these statistics is due to the predominance of heavy and relatively low-priced commodities in the 1951 output figures.

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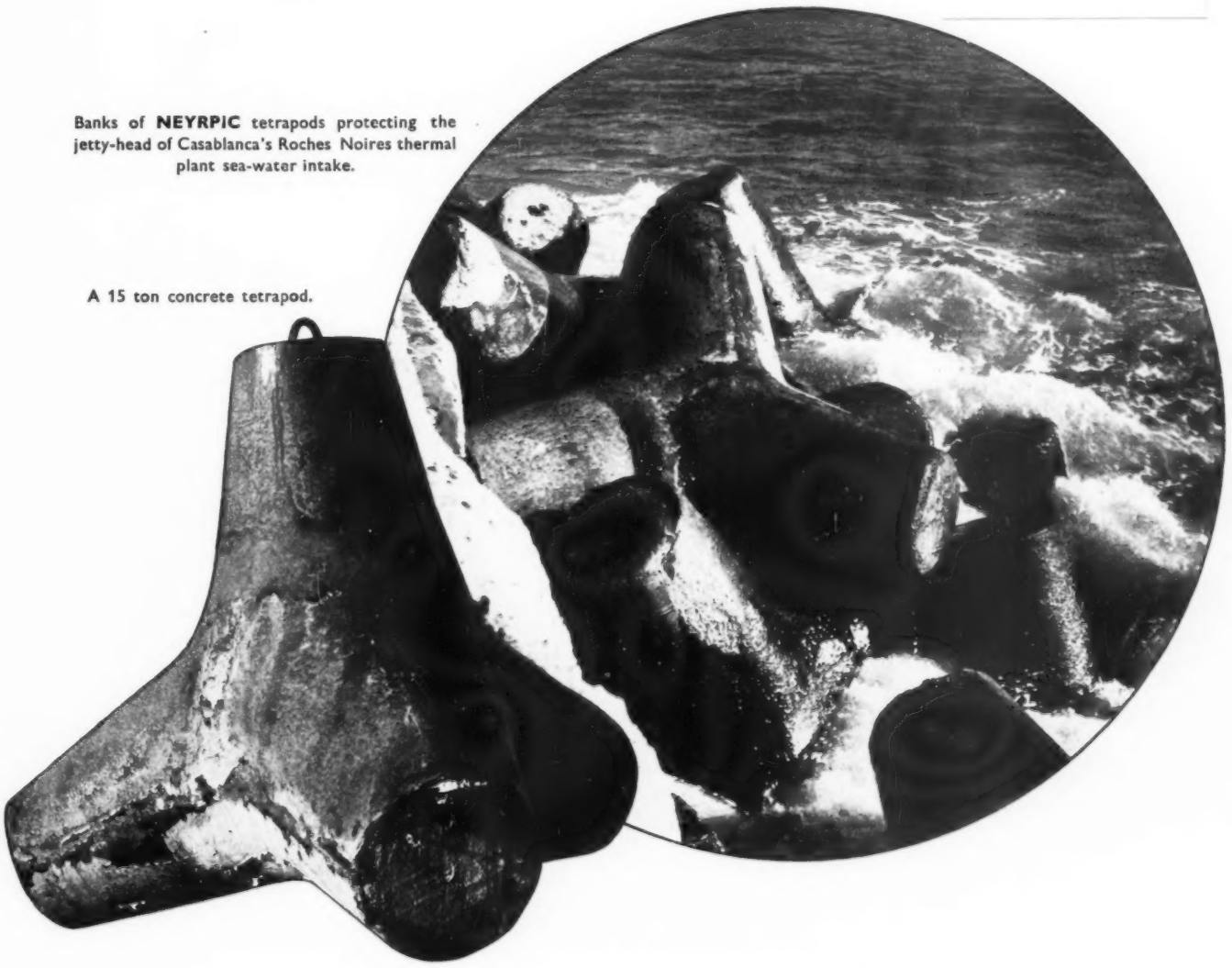


Stockholm Freeport

An Asset to Sweden's Foreign Commerce

By CARL G. WAHLQVIST.

FOR centuries European governments have established certain means, administered by the Customs authorities, in order to expedite and encourage foreign commerce.

The principal ones in Sweden since the turn of the century have been "transit-store," "entrepôt-store," "free-store," the drawback-system, and free ports. They can be divided according to Customs supervision and the owner's freedom to dispose of his goods before entry is made, and they represent a chain of development of which the final link is the free port.

In an ordinary Swedish port a ship's cargo has to be entered through the Customs and released within 14 days of arrival. During the following fortnight fines will be levied and thereafter the parcel in question is seized by the Customs and later sold by auction if not disposed of by the consignee. If a merchant does not want to enter his merchandise at once he can transfer it to a "transit-store" and later on, within one year, clear it through the Customs, send it in re-export to other countries or in transit to another place in Sweden with a Custom House.

The "transit-store" is a public bonded warehouse. It is locked by the Customs who also keep records of the goods. The owner of the goods is not allowed to sample, inspect or handle his goods but has to withdraw them in the same packing as they have arrived in.

Nowadays the "transit-stores" are of less importance for transit-trade or foreign commerce, and seem to be used mostly by shipowners when a consignee has not presented his Bill-of-lading for the disposal of his goods.

The "entrepôt-store" is another "old-timer" in foreign commerce which has been of special interest to importers. Contrary to "transit-stores" it is generally a private store—often a part of an importer's own warehouse and the merchandise has to be appraised, even if duty is not paid, before entering the "entrepôt-store."

It is locked both by the Customs and the owner and the Customs keep records of the goods. The owner may take samples but is not allowed to divide up or otherwise handle his goods and can finally withdraw them for consumption, re-export, etc., in the same way as from a "transit-store." As the merchant sells his goods he withdraws them from the store and pays the duty according to the previous appraisal. Thus he stores his goods duty-free until they are ready for sale.

Furthermore, in conformance with similar institutions in, for instance, Denmark and Germany, the Customs will give him credit for the amount of duty for three months and use the goods in the store as security—eventually combined with a banker's guarantee. However, both these institutions were not specially adaptable for a transit-trade with other countries, so the Swedish government in 1912 enacted a law regarding "free stores."

At that time there was a certain transit-trade with the Eastern states of the Baltic, free ports were considered too expensive, and by "free stores" it was hoped to obtain a medium to promote and encourage this trade.

With regard to Customs formalities it may be said that a "free store" to some extent was similar to the American Foreign Trade Zones. The Customs officials were on the payroll of the Grantee, they supervised the traffic by guards at the entrance of the warehouse, converted into a "free-store," and kept records of each parcel. Within the "free-store" the owner of the goods could divide, remark, sample and otherwise handle his goods before entering the Customs area or before re-export abroad. Manufacturer was restricted and retail sale not allowed. However, "free stores" never became a success and the Act was repealed in 1935 (when the new free port legislation was enacted).

Another facility of the same character and of special interest to the export industry, is the drawback system originating from the last century. A factory using foreign materials in their products can upon exportation get a refund of the duty paid.

All these Customs facilities are of special advantage, either for the import, export or transit-trade. However, all of them are represented in the free port institution which at present seems to be one of the best aids to bridge over many difficulties in world commerce.

In 1712 there were plans for a free port at Slite on the island of Gotland in the Baltic Sea which, however, did not materialise. In 1775 the town of Marstrand on the West coast of Sweden was made a free port (Porto Franco), which gave the town complete freedom of trade and worship. Marstrand became a free warehouse and commercial town, and a retreat of all, both foreigners and natives, who, because of debts or certain offences took refuge there. The project did not work, and at the request of the citizens of the town the privlleges as a free port, or more correctly "free city," were withdrawn.

The modern concept of free ports, as considered around the turn of the century, aimed primarily at simplifying Customs procedures for transit-trade. The "free city" of Hamburg was granted the privileges to use the harbour area as a free port when the city, in 1888, was incorporated with the German customs system after having had its own system of Customs based on free trade. In such a way arose the model and prototype for a free port in Northern Europe.

Textiles, grain, coffee and other colonial products destined for Scandinavia passed over Hamburg. The great shipping lines of the time centred in the city. The free port thus became a necessary institution for transshipment of a flow of goods arriving in large cargoes and for a transit-trade already in function on account of its favourable situation in a developed backcountry with extensions up to the Baltic and on account of good commercial connections. Several merchants had capital invested in the countries of origin. For certain products Sweden was entirely dependent on Hamburg. Thus it was commerce, and transit-trade that created the free port and not vice versa.

By the establishment of the Kiel canal, opened in 1895, Hamburg came into an even better position for a further development of its transit-trade with the Baltic.

However, Copenhagen had growing trans-atlantic connections and handled a great volume of traffic as it was almost the only import harbour in Denmark, in turn considering the rest of the Baltic as a natural area for an already existing transit-trade. In 1894 the free-port was established to further develop and promote this trade.

Sweden had established regular shipping lines with oversea countries in the beginning of the century. Finland and Russia offered a promising market and possibilities for transit-trade with goods by these lines. At the same time the harbour facilities were not always adequate to handle big ships with large cargoes. Free stores had not proved successful, and in 1919 and 1922 the free ports were constructed. While free stores were a development of the bonded warehouse-system, the free ports became more a development of harbour facilities to make the port more flexible and adequate to handle any type of traffic in order to promote foreign commerce as well as shipping.

Since then the political situation has changed the picture. Finland has her own direct shipping lines and to-day it may be said that transit trade forms a comparatively small part of traffic in the Swedish free ports. Furthermore, the general trend in world commerce seems to avoid detours between production and consumption.

This was also assumed in the discussions prior to the last free port legislation in 1935, where it was stated that the free port is considered to be the point over which the exports leave for and imports arrive from other countries and especially more distant parts of the world. There the export goods have to be assembled to be transported by big ocean liners to areas using the products of the exporting country. Colonial produce and other merchandise, which cannot be produced at home and in neighbouring commercial territory have to be brought from other parts of the world in order to be distributed from the free ports within the home country as well as within the neighbouring commercial markets which by means of more favourable customs institutions and more developed communications may be acquired.

Sometimes it is said that the value of a free port can be measured by the quantity of goods intransit to other countries which is passing over the port. This does not apply to Swedish free ports. They serve importers and exporters as well as transit-trade, and function at the same time as distribution centres, warehouses, assembly points and to some extent as industrial harbours, all of which has made them more flexible and favourable than any other Customs institution for foreign commerce.

There are three free ports in Sweden. One in Stockholm inaugurated in 1919 and two

Stockholm Freeport—continued

others in Gothenburg and Malmö, both established in 1922.

Administration.

The free port of Stockholm was built by the city of Stockholm at a cost of about 40 million crowns. It was leased to a joint stock company, all the shares of which are owned by the city. In such a way a smooth and businesslike operation has been obtained with the liability of a municipal organisation, and any foreign or domestic merchant can, with complete confidence, approach the free port company with their problems.

Besides the ordinary port administration the company undertakes to receive goods in consignment, deliver them according to instructions and also receive payment for same.

Goods in storage can upon receipt from the company be used as security for bank loans, etc.

The company arranges for all types of insurances and is prepared to serve its clients in every other respect.

Within the port there is a special post office for the free port traffic, a telegraph office, a branch office of one of the leading banks, a railway station for the receipt and delivery of goods in carloads or smaller quantities to any place abroad or within the country, and also restaurants.

Furthermore, there are all the institutions for clearing goods through the Customs so a tradesman can have almost his entire business within the free port.

As opposed to the procedure, for instance, in Copenhagen, the administration does not perform the stevedoring which is handled by private stevedores. However, practically all other work with the goods, all transportation within the free port, and the unloading and loading of lighters and smaller craft is carried out by the administration.

In this way a centralisation and coordination of the actual work is maintained resulting in great effectiveness and low costs. The administration manages Customs weighing and ordinary weighing by certified weighers, and weighing receipts are issued. The administration also loads and unloads trucks, railway cars and lighters, performs routine checking and clerking, coopering, etc., with its own personnel as well as handling, sampling and other labour.

Through this organisational structure there has been created the possibility of maintaining a relatively large permanently employed personnel, paid by the hour, skilled and well acquainted with their work and thus contributing to a smooth handling of all duties involved.

Facilities.

The free port covers an area of about 75 acres with 5,000 lineal feet of wharves offering 32 ship's berths with a 30-ft. draft.

There are four major warehouses and 12 one-storey sheds of lighter construction with a total floor space of about 947,000 sq. ft. The warehouses are heated against the cold weather in winter and in two of them there has been installed refrigeration space of about 59,000 sq. ft. for temperatures around 32° F. and 5,400 sq. ft. for temperatures around minus 6° F.

To the right, crane of latest construction. To the left, four double cranes with one crane house on the top and one below the bridge running on an extension. (See also picture 2.) Further to the left, cranes of older construction.

Grains are stored in silos with a storage capacity of 16,500 tons. These structures are equipped with pneumatic discharging devices which make possible the direct unloading from ship to rail, from ship to lighter and vice versa.

The warehouses are up to six storeys, inclusive of the basement. On the port side of the buildings are staggered landings in order that cargo by cranes may be discharged or loaded simultaneously to and from all floors, including the basement.

On the aprons which are 92-ft. wide, three railway tracks with many crossovers are constructed, and on the rear side of the warehouse there are two or three tracks with cross-overs and loading platforms about 16-ft. wide, for loading and unloading railway cars and motor vehicles

In order to accomplish a quick despatch of ships the free port has been equipped with the most modern cranes. The port owns about 40 cranes, of which eight are double cranes with 1½ to 3 tons lifting capacity. Newer cranes are of the rotating level luffing type with a lifting capacity of up to 5 tons and a swinging radius of about 82-ft. One can without difficulty work between ships lying side by side, and with several gangs in the hold, to quay and sea simultaneously, to any of the landings of the warehouse, and finally if desired to land the slingload comparatively far away from the ship and keep the apron clear for railway and truck traffic. Furthermore, 14 cranes are under construction, two of which will have a lifting capacity of 10 tons and 12 of 5 tons, some of which will be equipped with automatic scales. There are also available pontoon-cranes with a lifting capacity of up to 60 tons. This modern crane equipment, together with an extensive trackage on the aprons for direct loading and unloading, well designed warehouses, other handling equipment and last but not least a skilled labour force, make possible a quick turn-round of the ships. As an illustration it may be stated that up to 1,400 tons of general cargo have been discharged from a trans-ocean liner in 10 hours.

The Customs.

The free port is " foreign territory " with regard to Customs rules and regulations but not with regard to provisions concerning food and health inspection of imported goods, police, taxes, etc. The boundaries are patrolled by Customs guards and at the entrance the Customs control the traffic. A general supervision of cargoes is performed by the manifests with regard to prohibited goods, etc., and for practical reasons there is also a certain Customs supervision within the port. But as a whole the Customs take no interest in the goods until they pass the boundary or otherwise, for instance, after they have been placed in Customs custody, following appraisal.

Within the free port the owner, generally with labour from the administration, is entitled to handle his goods in every possible way without any Customs interference.

Those who rent so-called "private stores" are obliged to keep book records of receipts and deliveries, which books from time to time are checked by Customs officials for control.

For the Customs paper-work there is a " Customs house." Appraisement of general cargo to be opened for inspection is performed at five " Public stores." Bulk goods such as coffee, sugar, fruit, etc., with specific duty are weighed and the duty assessed at special Customs-booths in each warehouse.

Stockholm Freeport—continued

There is no entry of goods or placing of bonds but the users can place a guarantee to a certain amount to save time at the payment of duty. The whole procedure for withdrawal of goods is then to get the administration's agreement on the Customs form so that the parcel may leave the free port. The paper work is reduced to a minimum which is necessary to enable, for instance, a wholesaler to use the free port as his warehouse from which he can distribute his goods. As an example may be mentioned that a parcel of coffee can be entered, weighed, the duty assessed and the bales delivered within one hour.

The rates of duty are assessed at the time of importation from the free port.

" Immediate liquidation " of goods as in American foreign trade zones is not available but an importer can pay the duty according to prevailing rates and then store the goods in the free port up to one year with the agreement of the Customs.

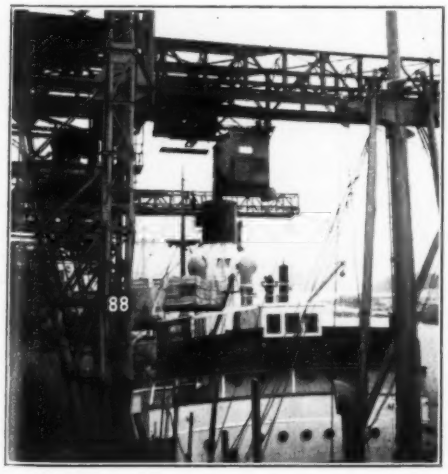
Foreign goods destined for other countries can, at low cost, be stored and later on transshipped with a minimum of Customs formalities.

Domestic goods can also be stored to complete a company's stock and returned duty-free to Customs territory, and refund of duty for previously imported goods can take place upon " exportation " to the free port.

Storage, Distribution, Assembly.

The free ports act as storekeepers for the foreign seller, for the importer or the exporter. Instead of, for example, an importer of coffee and other colonial products having to build his own warehouse to which he brings his merchandise in big parcels and then distributes them to his customers, he can use the free port as his store and there divide, repack, label and otherwise manipulate his merchandise, and then distribute it as desired, with no unnecessary transportation costs and a minimum of Customs formalities, and pay the duty as the goods are disposed of.

He can also store domestic goods if necessary for completion of deliveries to his customers. Should he find it favourable to extend his distribution to a foreign country, he can do so with a minimum of Customs interference (at present he needs special permission from the Ministry of Commerce). If he wants to go into the export business, he has all facilities at hand for storing, loading in ships and other transportation devices, as well as all Customs institutions for exportation according to the drawback system.



Double crane with extension under which crane house is running. Crane house on top (not visible) is working in same hold. (See also picture 1.)

If he needs capital he can get loans on his goods in storage as the free port company's warrants are negotiable in the banks. Furthermore, he need not keep any permanent staff to handle his goods in storage as all labour is performed by the operator. He pays in practice " wages " only for the actual time his goods are handled. The same applies to storage-costs as they increase and decrease according to the fluctuations in his business.

He can receive goods by ship, rail, trucks, post and any other means of transportation from all parts of the world and in the same way deliver to his customers. He can send by post or air through the post office, as freight or in carloads through the railway station, by small motor cars or road transport, by small coastal ships or ocean liners and all is concentrated within a comparatively small area which means a minimum of transportation costs.

The merchant can also rent a so-called " private store " at a fixed rate within which he can keep his goods unpacked and displayed and deliver after handling as desired. He can rent showrooms and offices enabling him to have his whole busniess at the port. Generally firms have a head-office at one place and a smaller branch office at the free port for all work in connection with the receipt and delivery of goods.

With shipping lines regularly calling at the port, goods for export can be stored pending the ship's arrival. Sometimes, for instance, machinery is produced in parts at different factories and the parts assembled at the port to form the whole shipment before being loaded.

The free port can also be used as the assembly point for despatching goods to ports which are only visited on certain occasions. At the same time it is always possible to make use of the free port institution for refunds of duty upon " exportation " to the port according to the drawback system.

Retail-Trade and Exhibition of Goods.

Retail-trade is not allowed within the free port. A private person cannot buy anything for his personal use or for consumption within the port. Any person visiting the freeport as a prospective buyer has to be a wholesaler using the article in his business.

There are special showrooms where the seller can display his goods for prospective buyers in an attractive way without any duty-liability. Articles which are not saleable can be returned or sent to more suitable markets with little Customs interference.

The merchant can use his own staff within the locality, or request labour from the administration according to a fixed rate by the hour, and furthermore he has all the communications to receive and deliver goods to and from Sweden and other parts of the world.

Discharge of English motor cars in the Stockholm free port.

Manufacture.

Manufacture is only allowed by special permission from the government. In the past there has been some industrial activity but to-day it is of little importance.

Sometimes it has been claimed that manufacture in free ports would make the ports centres for foreign activities in competition with the domestic industry, and therefore it would be of no value to the home country. Experience does not justify this opinion. With present communications, an industry in a free port does not seem to have a more favourable position than in the foreign country. Foreign commerce has to be a two-way street. The American Foreign Trade Zones have also, by the amendment of 1950 to the free port legislation, been admitted full manufacture rights and more liberal conditions in this respect. Wages and real estate in big cities do not seem to encourage any extensive manufacture in free ports. At the same time there has sometimes been difficulty in drawing the line between manufacture and handling. Assembling, blending, rinsing, cleaning, grading, sorting and such activities do, however, frequently occur in Swedish free ports.

Traffic.

The number of vessels and volume of goods traffic has, apart from the fluctuations in world trade in recent years, undergone a steady development. The connections with the United States are good with three regular lines to New York and the East Coast and two lines to the Great Lakes. To the West Coast there are two sailings a month as well as regular sailings to the Caribbean Sea Ports, Central and South America.

Shipping lines to the Mediterranean and South Africa also make regular calls at the free port together with ships from Australia, East Asia and other parts of the world. Ships

(concluded on page 315)

Corrosion and Preservation of Iron and Steel

A Review of Recent Technical Researches

By HENRY F. CORNICK, M.C., M.I.C.E.

(continued from page 285)

Protection Against Corrosion

Maritime structures of cast iron and steelwork have to withstand corrosive conditions which are broadly:

(a) Exposure to sea-air or humid river-air, i.e., above high tide levels.

(b) Subjection to varying high and low tide levels.

(c) Complete immersion, i.e., below low tide levels.

(d) Below ground level either ashore or in water.

Considered from the point of view of dock installations, buildings and structures generally together with marine structures, the following may be given as the principal preventive measures which may be taken to protect steelwork from corrosion:

(1) Consideration of factors connected with the design of steelwork.

(2) Efficient preparation of surfaces of steelwork for reception of protective coatings.

(3) Organic coatings.

(4) Metallic coatings.

(5) Cathodic protection.

Design. Where the steel structure or parts of it are subject to any of the conditions in group (a) or (b), the most important consideration is that of ensuring that the outer surfaces are completely accessible for the application of subsequent protective coatings. There should be a minimum of totally enclosed spaces and if some are unavoidable they should be hermetically sealed after having been first coated with whatever protective coating is selected. If large enough for men to enter, they should be provided with manholes. Steelwork structures should have no pockets where water can collect.

Preparation of Surfaces. The first consideration to ensure successful protection is the complete removal of all mill-scale of steel sections, which varies in its tenacity of adhesion to the metal to which it is cathodic in action and thus, unless completely removed, may cause pitting as a result of electro-chemical action. In addition to the older methods of removing mill-scale and rust such as pickling in an acid bath, chipping, hammering and wire brushing; sand or shot blasting of members and flame-cleaning before and after assembly and erection are useful modern procedures. It is important that the steel sections, plates and bars are completely cleaned before assembly. Flame cleaning by oxy-acetylene flame has a considerable advantage; besides efficiently removing scale and rust, it also removes grease and dirt and followed immediately by wire brushing, provides a clean, dry and warm surface for the first or priming coat of protection dressing. Needless to say all preparation and coating should be done in the dry and preferably during the drier months of the year. Unrusted steelwork seldom forms a good surface for paints, and weathering or treating with phosphoric acid may be necessary. Moreover, as has been alluded to, the formation of a film of oxide provides a natural first defence against subsequent electro-chemical corrosion.

Organic Coatings. The cost of efficient preparation of steelwork surfaces together with that of application of coatings is far in excess of that of paints. It follows, therefore, that careful consideration must be given to the selection of the most appropriate and suitable coating for the particular structure and the corrosion conditions it will have to withstand, in order that the expense entailed in preparation will not be wasted.

Naturally the first or priming coat and its application after preparation of the surfaces are the most important steps in providing an efficient protective organic coating. It must be put on when the surfaces are dry and preferably warm, and paints of the air-drying type are mostly used at the present time.

The Corrosion Committee of the Institute of Civil Engineers, in the course of one of the Interim Reports, recorded the results of tests which had been carried out in respect to the protective properties of certain paints. The following are briefly the conclusions arrived at:

(a) Multiple coats of paint, thin and well brushed, generally afforded better protection than single coats.

(b) Litho-oil with iron-oxide gave encouraging results in aerial and half-tide tests, whilst dilution with kaolin, silica, or mineral white exerted no appreciable effect on the protective power of paint.

(c) There was little to choose between the different iron-oxides and, whilst red and white leads were rather superior to iron-oxide in air and half-tide conditions, they were somewhat inferior in complete immersion.

(d) Red lead was somewhat superior to white in air and half-tide conditions, and the reverse under complete immersion, whilst mixtures of the two gave intermediate results.

(e) Lead-chromate paints appeared to be promising. Anti-fouling paints containing cuprous-oxide and zinc-oxide were inferior to iron-oxide paint under complete immersion.

(f) Coal tar and asphalts found wide application as protectives of metal surfaces. The present technique is thorough cleansing of the metal, followed by cold application of the appropriate primer, which consists of a heavy material base in a volatile diluent. When the primer is dry, the enamel is applied hot. The enamel may be a straight asphalt or a coal tar product; alternatively it may be a mastic-containing filler such as slate powder, talc, etc. The melting-point of the primer base should be lower than that of the enamel to obtain good adhesion to the metal.

These results are by no means conclusive and leave a good deal of latitude in the choice of protective organic coatings for steelwork in various situations. As far as it is practicable to formulate any general suggestions, it seems that a priming coat of good red lead or red paint followed by finishing coats, with a vehicle similar to that of the primer will give good results for all steelwork above water line, and more particularly for structures such as portal and other cranes and the like. The aim should be to obtain a coating which is continuous, firm, and with good adhesion to the metal surfaces, priming and all others being homogeneous throughout the full thickness.

Below water level a red lead, but preferably iron oxide, to avoid any tendency to galvanic action between two metallic surfaces, priming coat followed by a coat of tar treated with lime and tallow have given excellent results, while it is recorded that for above water steelwork of a jetty in Beira a mixture of cement, paraffin and coal tar in proportions of 1 : 1 : 8 was used. The resulting surface was hard and glossy and was an effective protection.

The Angus-Smith treatment, largely adopted for cast iron pipes, consists in dipping them, at a temperature of 700°F., into a mixture of coal tar, pitch, linseed oil, and resin, at a temperature of 300°F. The process is an admirable method of preservation, and enjoys a considerable reputation, but other compositions based on coal tar, pitch or bitumen are now sometimes used instead of the Angus-Smith materials.

Bituminous coatings have a good protective record and of this class of coating there are a number of excellent proprietary specialities. The war-time necessity of using substitutes for many imported materials for paint manufacture still remains and the

Corrosion and Preservation of Iron and Steel—continued

Chemical Research Laboratory of the D.S.I.R. in 1946 published a Report[11] in which is reviewed existing information on bituminous materials, coal tars and allied with other materials for use in corrosion prevention, marine conditions being specially underlined. The data is very comprehensive and precludes any attempt to condense it in this review.

Mention must be made of the work of F. Fancutt and J. C. Hudson carried out on behalf of the Marine Corrosion Sub-Committee of the British Iron and Steel Research Association. This research was specially directed towards anti-corrosive compositions for ships' bottoms and under-water steelwork. Space does not allow of the published details[12/13] of this work to be reviewed. Since 1949 a new organisation has been set up entitled " The Joint Technical Panel N/P2—Paints for Under-water Service on Steel," upon which are represented the Admiralty Corrosion Committee, the British Shipbuilding Research Association, Composition Manufacturers besides members of the original Sub-Committee.

The work of this Panel has been to extend previous work and that of Fancutt and Hudson, and its first Report was published in the summer of 1950, and is obtainable from the British Iron and Steel Research Association, free of charge. What has been said here in respect to the general question of preparation and leading considerations as to paints and painting are confirmed in the Report, but the particular interest lies in the description of tests of quite new formulations and several special media, which are too lengthy to be dealt with here, but the writer's very brief review of the Report in *The Dock and Harbour Authority*[14] may be perused together with Dr. Hudson's own paper[15] upon the subject.

Concurrently with research work undertaken in this country, much work has been done in other countries, and in particular should be mentioned the United States[16].

Protection by Cement Concrete.

Mention must be made of the protection afforded to iron and steel by concrete or cement. The adhesion between steel and concrete being, one remembers, one of the basic principles of reinforced and pre-stressed concrete. Considerable anxiety was expressed many years ago as to the possibility of reinforced concrete structures being adversely affected by stray electical currents. Investigations were carried out by various authorities, among them the United States Bureau of Standards[17] prior to the First World War, who reached the conclusion that dangerous anodic attack on the steel was unlikely, since the alkaline character of the surrounding cement leads to passivity. An exception, however, was made in cases where the concrete contained appreciable amounts of chloride, which in any case is always regarded as a dangerous component in cement. The attainment of dense impermeable cement has in recent years been given a great amount of attention, particularly in its application to marine structures.

Metallic Coatings. In considering metal coatings the dock engineer will normally be concerned only with those for the preservation of iron and steel. The most well known method is, of course, galvanising, the cost of which is somewhat high and precludes its use on the main members of structures with which we are here more concerned. " Sherardising " is a cheaper process of coating articles with zinc, by heating them in zinc dust. The zinc combines with the surface of the iron, steel and other metal at a temperature below the melting point of zinc. The process is patented and is largely used for bolts and nuts and small articles.

Calorizing is a somewhat similar process of coating iron and steel with aluminium.

Fused zinc or aluminium applied by flame pistol to steelwork structures after fabrication and before or after erection is often used for special parts difficult of subsequent access or subject to adverse conditions. This process is very effective but somewhat expensive.

The life of any of these coatings is substantially proportional to the mean thickness of the coating, and here it must be pointed out that the metallic coatings must be of adequate uniform thickness over every portion of the surfaces. If there are places bare of coating or of inadequate thickness, in conditions such as complete immersion or in atmospheric conditions in industrial or sea coast districts where sufficient moisture can exist in the vicinity of the bare areas, galvanic action may be set up. In such circumstances the coating may be anodic to the metal of the structure in which case the covering metal will be attacked, the bare surfaces of the steel being protected. On the other hand, the coating may be cathodic to the structure, when the metal of the structure will bear the attack locally, corrosion being accentuated by reason of the smallness of the anode and largeness of the cathode.

Examples of anodic galvanic action are provided by coatings of zinc and aluminium, the latter being less anodic in action, while tin in certain conditions is generally cathodic The qualification should be noted for conditions of environment and exposure to corrosion may bring about a change in the normal polarity.

The main objective should be to not only preserve the metal of the structure, but the coating also, and for this reason metallic surface coatings may be painted with lead or oxide paints, bituminous coatings (not tars which are apt to be acid) or one or another of the newer types of anti-corrosive paints. Which of there are more suitable has, up to the time of writing, not been definitely substantiated.

Before leaving the subject of coatings, it is necessary to refer to the British Standard Specifications for paints and to the B.S. Code of Practice for Painting Iron and Steel[18] which is in draft. This Code which, of course, is not yet in its final form, deals with preparation, selection of coatings, application and, among other considerations, maintenance painting.

Cathodic Protection. We have seen that the corrosion process is electro-chemical and made up of anodic and cathodic components which can be influenced by appropriate means. Cathodic protection is, in effect, the control of the mechanism of the corrosion process.

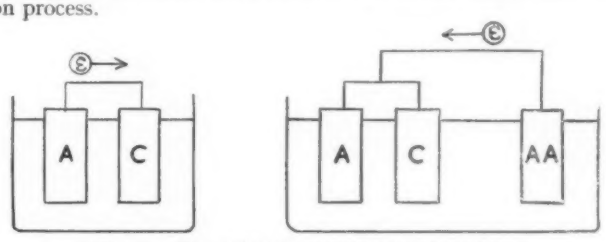


Fig. 4. The Principle of Cathodic Protection.

Dr. Vernon, some of whose work, described in his paper to the Royal Society of Arts, has been reviewed and quoted in certain paragraphs in preceding pages, gives a diagram (Fig. 4) that illustrates simply cathodic protection principles, which involve merely the application of a counter electric current opposing that responsible for corrosion, thus rendering the whole structure cathodic. The essence of cathodic protection is that it prevents iron ions leaving the surface of bare metal and becoming ultimately oxidised, that is to say forming rust, in the manner previously referred to. In the figure A and C represent the anodes and cathodes of a system undergoing corrosion, the A zones corrode because they continually provide electrons to make good the deficiency of them in the C zones. If an auxiliary external anode AA, is provided, i.e. an external source of electrons, corrosion of A zones will cease if the supply of electrons from AA to C is equal to that previously forthcoming from A, in other words, if the original cathodes C are " polarised " to the same negative electric potential as the original anodes. Any further increase in the superimposed E.M.F. will still further depress the joint potential of the original A and C zones.

Two methods of applying the necessary superimposed current are possible in practice. Structures of iron or steel either wholly immersed or partially immersed or buried in the ground may have a cathodic current of sufficient density and E.M.F. impressed upon them by (a) the use of external anodes of magnesium, aluminium or zinc, or (b) anodes of scrap iron may be used, the necessary current being supplied by an external generator. In both cases the external anodes are sacrificial, that is to say, they themselves are dissipated or corroded instead of the anodic areas of the structure.

Neither of these methods of arresting corrosion, strictly speaking,

Corrosion and Preservation of Iron and Steel—continued

is new, for Sir Humphrey Davy (1778-1829) was the first scientist to employ an electric current to the problem of chemical decomposition, and it was he who first made use of blocks of zinc for the protection of the copper sheathed hulls of the timber built vessels of his day. It is only within comparatively recent years that research has been systematically undertaken in respect to the electrochemical aspect of corrosion of metals and protection on cathodic

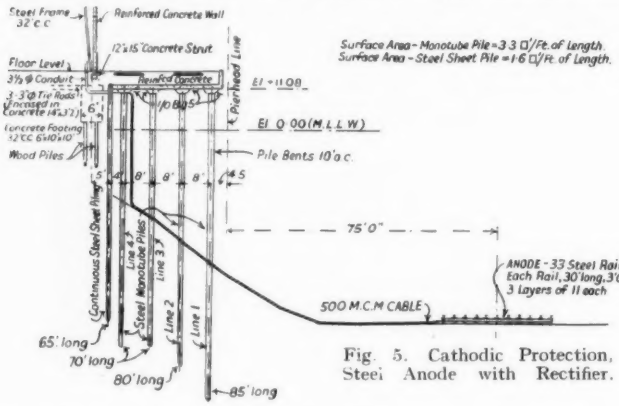


Fig. 5. Cathodic Protection, Steel Anode with Rectifier.

principles of applied currents. In America the protection of buried pipe lines by cathodic methods has been successfully applied for many years on a large scale and basically the system is more or less as simple for the protection of steel piling and structures in water. The real problems arise in the determination of just what amount of electricity is required to fully cathodise a given type of structure in given conditions and environments, together with the decision as to which form of cathodic protection is the more suited to the particular case of a whole and the form and design of the structure in particular. In respect to the method of applying to an external anode, a generator produced current of electricity, a fact of some importance which emerges is that if the installation is started up with a current of sufficiently high density, after a certain lapse of time it may be reduced to a very small amount, as a " maintenance " current.

In the United Kingdom the Corrosion Group of the Chemical Research Laboratory of the D.S.I.R. has conducted research specially devoted to cathodic depolarisation, early work being that of H. J. Bunker[19], and later that of W. H. J. Vernon[20], K. R. Butlin, M. E. Adams and M. Thomas. Further investigations are at the present time being carried out by the three latter investigators.

It is possible to give four examples of the practical application of cathodic protection of certain maritime structures. The first is a summary of the methods adopted for the protection of the steelwork of the wharves recently erected at the Port of Long Beach, California, and described by Mr. R. R. Shoemaker, Chief Engineer of the port in *The Dock and Harbour Authority*[21], an excerpt from the article is as follows:

" A great deal of experimental work was done in an attempt to arrive at the most efficient form of installation. Two general types of cathodic protection will be installed initially, one using a steel anode, with a rectifier for converting alternating current to direct current, as the energy source, and the other type using galvanic anodes (see Figs. 5 and 6 showing the lay-out of the installations at Pier A, Berths 3 to 7). The effective protection of either type of installation is about equal, though details of local conditions may eventually result in the selection of one of these types of installation exclusively. Initial costs of the rectifier system are expected to exceed those of the galvanic anode system, with a reversal of this relationship for operation and maintenance costs.

" It was found that with the steel anode in combination with a rectifier, the connections of the electric cable at the anodes have a tendency to dissipate long before the anode itself has been dissipated, and the resultant corrosion of the cable make economical use of the steel anode difficult. Tests indicate, however, that by making a multiple grill work of scrap steel rail, and bonding the stranded cable lead at numerous locations on the anode, this problem may be overcome. Each bond should be well coated with a high dielectric coating to prevent electrolysis at the joints. With the steel anode constructed in such a manner that current dissipation over the entire surface of the anode is more uniform and with electrolysis of the electric cable and the cable bonds prevented, it is expected that little trouble will develop.

" Magnesium anodes acting as a galvanic anode provide satisfactory protection against corrosion; however, what is the economical size of anode, and what the replacement charges, other than material costs, will be over a long period of time, has not been determined. Some difficulty may be expected in attaining satisfactory current distribution, due to the geometric layout of the steel piles to be protected. Electrical connections to the anode do not seem to be such a problem as with the steel anode and rectifier energy source.

" Aluminium anodes are a possibility also, and it is intended to install a trial unit of this type. Each of the first three units will involve about 250 lin. ft. of wharf having about 130 steel monotube piles each. These units were all bonded together, with electrical connections within the mass of the concrete wharf deck, at the time of construction.

" For anti-corrosion protection of the steel piling about the mean tide level, some type of coating seems to be imperative, because this portion of the steel piles is subject to intense oxidation and possible potential change. This condition makes initial polarisation from a cathodic protection installation almost impossible in that particular area. Some of the recently-developed vinyl coatings are good dielectrics and have excellent ability to adhere to the steel surface. The abrasion to which such a coating is subjected is very minor and presents no problem. It is felt that a satisfactory protective coating has not yet been found and it is intended to experiment on a number of types."

The next example is that of the cathodic protection against corrosion of the steel sheet piling at the Tyne Commission Quay at Newcastle. The work was put in hand in 1951, and consisted of an adaptation of the galvanic anode system. The following is

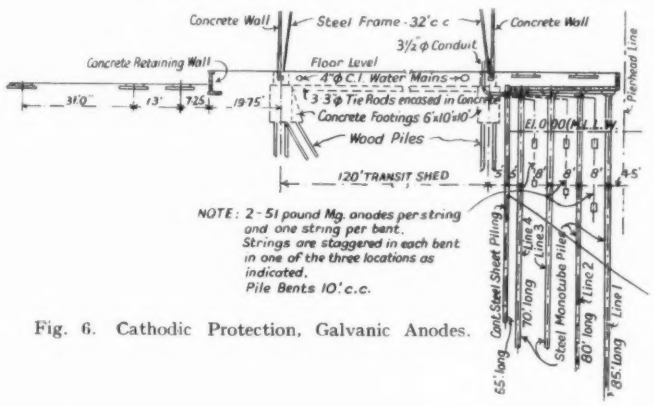


Fig. 6. Cathodic Protection, Galvanic Anodes.

a description of the methods employed which appeared in Lloyds List and Shipping Register of December 20th, 1950.

" The piling, consisting of 15-in. by 5-in. rolled steel joists, extends under the quay for a length of some 900-ft., and recent measurements have revealed that during the past 22 years the piling has corroded between low water level and mud level to as much as one-third of its original thickness of 0.42-in.

" It is planned to hang about 100 hemispherical magnesium anodes, each weighing 200 lb., every 9-ft. along the length of the piling, staggered front and back. They will be suspended by wire ropes from the concrete bracings of the quay, and will not interfere with traffic. Each anode will be connected electrically to the steel piling and with the sea water as an electrolyte, a simple battery would be formed. Current flows from

Corrosion and Preservation of Iron and Steel—continued

the anodes through the sea water towards the piling and back again via the electrical conductors. The anodes would be slowly eaten away while the piling would receive a deposit of magnesium hydroxide. All corrosion in the steel would cease since no current would be able to flow from the steel into the water to give up metallic ions—an essential feature of all corrosive action.

" The method was recommended because it was regarded not only as the only practical and effective way of dealing with the trouble, but also because the cost of initial installation and upkeep is estimated to be very much less than the alternatives of concrete encasement and the prevention of corrosion by surface treatment."

A further example of the adoption of cathodic protection by electricity provided by a generator is that of the use of this method at Curacao, Dutch West Indies. The protected structures in this case were the wharf walls, constructed on the cellular cofferdam principle, forming two finger piers, some 300 metres long by 90 to 100 metres wide. Above waterline the " Senelle " sheet piling of the cofferdams was embedded in a concrete coping on the quay side, all the steelwork was therefore either totally immersed in water or buried in the ground. The new Harbour of Curacao is the subject of an article in *The Dock and Harbour Authority*[22], while the constructional details of the installation are not supplied, the following notes are based on some of the author's remarks: The current necessary to decrease the potential of the protected steelwork was very small, the voltage being of the order of 0.2 to 0.5. The choice of utilising the port electric installation through transformers and rectifiers, or a power plant or galvanic cells, which latter were apparently on the market in America, was made in favour of the former system after consultation with the National Association of Corrosion Engineers of Houston, U.S.A.

The anodes consisted of steel scrap buried in several places and their renewal was not anticipated before the lapse of ten to 20 years, and this was taken into consideration during the constructional work. At the same time it was realised that replacement could be avoided by the use of graphite anodes which, however, introduces other phenomena, among others, an increase in the current required. Care was taken to ensure that all parts of the entire steelwork structures were connected in an electrically satisfactory way with the negative pole of the source of the current, which so becomes the cathode of the system with the scrap iron as the anode. Although the polarising currents theoretically cannot exist when the metal is covered with an insulating material, nevertheless it was realised that by omitting an insulating paint covering, the electric installation would need to be larger and more expensive. Moreover, the annual cost for current would become ten times greater. It was, therefore, decided to use three coats of bitumastic material, of the best quality, on the steel.

The details of the costs of the work were triple treatment of steel with bitumastic about Cfl. 150,000, while that of the complete cathodic protection (including the fixing of the electric wiring) was around Cfl. 40,000, the annual charges for current being about Cfl. 2,500.

Further particulars of Cathodic Protection are given in the list of references, which is appended.

In this review, the author makes due acknowledgment of the fact that he has drawn extensively upon the work of Dr. U. R. Evans and Dr. W. H. J. Vernon, head of the Corrosion Section of the Chemical Laboratory, upon the electro-chemical aspects and cathodic preservation fundamentals of the corrosion of metals, a lecture on which subject appeared in the Journal of the Royal Society of Arts[23]. He trusts that in condensing for the purpose of this short review, simplification has not detracted from its scientific value. The author's object has been to present in the short space available as much as possible of the latest information and sources of data upon a subject which, in the present world situation of shortage of steel and need for conservation and preservation, is of the greatest importance and one which should be studied more closely than heretofore by all users of steel in every country of the globe.

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Stockholm Freeport

(concluded from page 311)

from England and the European continent usually berth in other parts of the Stockholm harbour. Goods arriving by these ships with free port destination are transferred under Customs supervision by sea or land transport. In such cases the Bills of Ladings should be issued directly to " Stockholms frihamn " and not only to " Stockholm."

The free port distributes about half of Sweden's coffee import and the greatest part of the import of fruits to Northern Sweden; the refrigeration space is constructed especially with regard to this type of traffic. Exports consist primarily of paper and machinery with quantities somewhat fluctuating because of the length of the winter when Northern Sweden is icebound.

The total cargo movement amounted in 1951 to around 600,000 tons.

The Modern Trend.

At present a tendency can be traced towards the amalgamation of business enterprises, the formation of combines and central buying organisations which buy their goods in considerable quantities for distribution to their members.

Larger volumes of traffic admit a more continuous operation and the use of modern materials handling devices within warehouses, sheds and other areas, resulting in lower tariffs.

The free port institution extends the usefulness of a port facility for all activities of foreign commerce usually regulated by different Customs institutions.

Coastal shipping over short distances has declined in recent years and its rôle has largely been taken over by modern land transport, by road vehicles, electrified railways, etc., which in turn has enlarged the area served by the free ports.

The free ports have developed by means of more liberal Customs institutions and are offering the most flexible and economical operation for delivery and receipt of goods by land or sea.

With such ports placed along the coast of a country, each serving their respective natural trade areas and eventually other markets, from which goods can be distributed with a minimum of Customs formalities, and to which places the goods can be gathered and released from export restrictions for export in big shiploads, there will become valuable expedients in promoting foreign trade.

With an increasing rationalisation of the distribution of goods through few and bigger organisations using some central points for storage and distribution, with modern land transport of a larger range of action at economical costs, and with the present high standard of sea communications, such ports will play an increasing rôle as distribution centres for foreign commerce.

Prefabricated Pier on Orinoco River

New and Unique Method of Construction

A prefabricated pier or wharf that can be towed to out-of-way locations and there lift itself into position has proved its practicability and ruggedness during almost two years of service in an Arctic installation that was recently disclosed as being the new United States air base at Thule, Greenland. A similar installation has just been completed at the Orinoco Mining Company's new iron ore shipping station on the Orinoco River in the interior of Venezuela, and the details of these piers were first made known in the summer of last year.

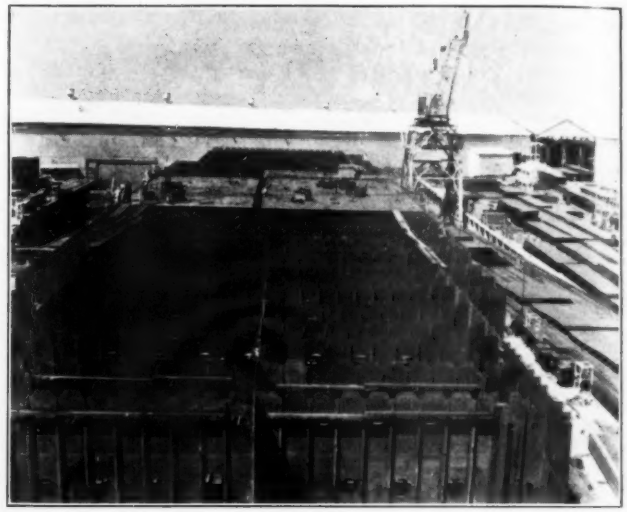
These unusual structures were designed and constructed by the DeLong Engineering and Construction Co., New York City. The key to the success of this new type of pier or wharf construction lies in the use of the DeLong Airjack invented by Colonel Leon B. DeLong, which was first used in the construction of offshore oil well drilling platforms several years ago.

The principle of the DeLong pier or dock consists of a fabrication of sections which are towed, in some instances, over thousands of miles of ocean and erected at site of permanent location to form any size structure, depending on the number of sections used. The Orinoco Mining Company dock was constructed of three sections, each 82-ft. wide by 377-ft. long, giving a completed structure of 82-ft. by 1130-ft.; whereas the Greenland installation is composed of four sections each 50-ft. by 250-ft., making a completed structure 50-ft. wide by 1000-ft. long. The piers rest on 6-ft. diameter caissons, or columns, which are towed to the site on the barge-like sections together with all other construction equipment and gear necessary for the erection of the structure.

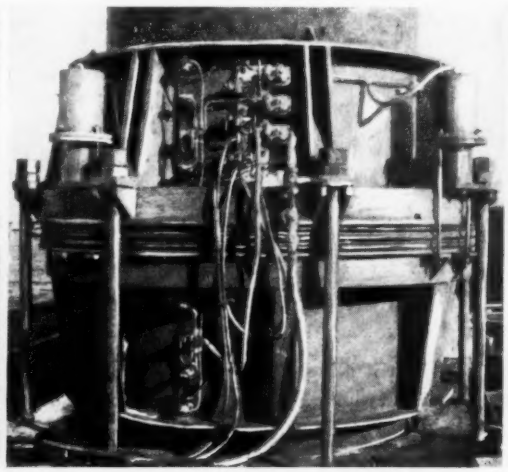
The pier sections were fabricated for both projects referred to above in Texas shipyards. The Orinoco Mining Company pier involved a tow of about three thousand miles and the Greenland tow was about 4,800 miles.

It is interesting to note that the entire field construction of the pier can be accomplished without landing and without depending on land facilities or land-borne equipment, supplies, or other material. The erection of the pier sections require the use of a very small field organisation who are flown to the site upon the arrival of the first pier section and who could, if need be, maintain their living quarters on the pier during erection.

Another important feature of the DeLong dock construction is the unprecedented speed of erection of such large, heavy duty structures. From date of signing of the contracts to the initial use of the structure for berthing ships and unloading owner-owned cargo, there was an elapsed time, on the average, of four months. During these four months DeLong engineers designed the structure to meet the owner's cargo handling requirements and to fit the geophysical and flood or tide conditions at the terminal site; then the pier sections were fabricated in reputable and experienced fabricating plants, launched, outfitted and towed to site; then erected. The first pier section can be put to use for unloading ships within a week after its arrival at site and unloading of ship cargo can take place even while the pier section is being completed by the construction organisation. Subsequently additional sections are brought in and added to the first section to form the completed pier without interfering with the steady stream of owner-owned cargo which might arrive for unloading on the pier. The accompanying illustrations show the steps of fabrication, towing and



Pier section under fabrication, bulkheads and interior.



(Left). When pier section reaches site, crane picks up caissons and places them in air jacks. (Centre). The key to erection is this circular jack whose upper and lower halves alternatively grip the pipe column to raise the barge. (Right). Crane placing steel caissons, 6-ft. dia. by 100-ft. long, and weighing about 40 tons, into wells fitted with air jacks.

In design, the pier section is a hollow steel box divided into several water-tight compartments for rigidity and for safety in towing. The pier sections were fitted with oil and water pipes, ship mooring devices, air compressors, and, in the case of the Orinoco dock, there were tracks for travelling crane and for loading conveyors. After launching each pier section was loaded with its own caissons 6-ft. in diameter and in the case of the Orinoco project, 100-ft. long, with a crawler crane for erecting them and with air compressors, welders and all other equipment and gear necessary for the complete erection of the structure.

If desired, other equipment or cargo not essential to the pier construction can be shipped for the owner, because the dock sections, appearing as barges during the tow prove very stable while afloat and can carry large and heavy surplus cargo.

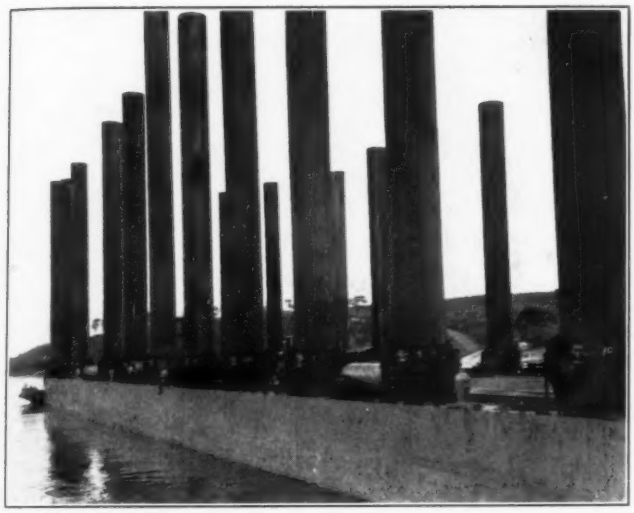
Prefabricated Pier on Orinoco River—continued

erection. One photograph shows the first ship docking at the Orinoco terminal (Puerto Ordaz, Venezuela) within a week after this first section arrived.

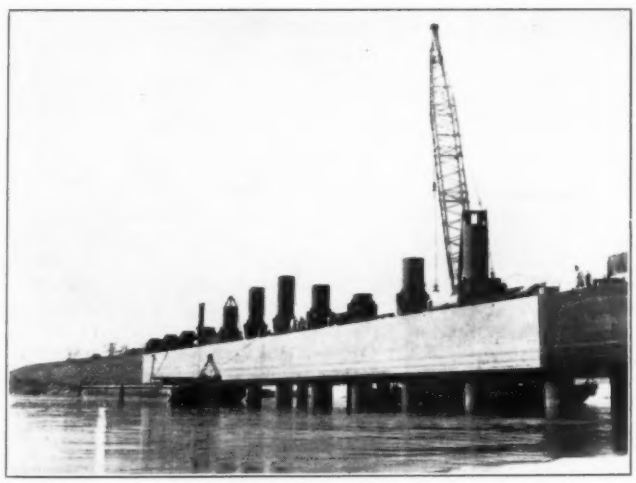
When a pier section arrives on the site of an installation, it is first manœuvred into approximate position and moored until the crane on the deck can hoist and lower the pipe columns or caissons through the holes, where they are gripped temporarily by DeLong Airjacks. Then the barge is shifted into precise position and the caissons lowered until they reach the bottom. They readily penetrate any loose material to become firmly anchored for the next step, which is the self-lifting, or jacking operation.

The next step is to raise the pier section to final elevation. Raising is accomplished by means of the airjack. Fitting over the circumference of the caisson and attached to the deck of the pier section, the airjack climbs the caisson much like a boy climbing up a tree trunk. The boy holds to the tree with his knees while he reaches up with his hands for a new grip, then releasing his knees he pulls his body up with his hands and grips the trunk with his knees again. Once again, reaching his hands upward for a new grip he releases his knees and repeats the performance. The airjack is made in two halves, or cylinders, the top halves of which may be compared with the boy's hands and the lower half with his knees. Each two minute cycle of the airjack lifts the pier about 6-in. In this manner, step by step, the section is made to climb up the caissons. The jacks are operated by compressed air through a master control and individual of the jacks permits adjustments or levelling off when the section gets out of plumb due to the fact that as the airjacks lift the section out of the water the caissons are further driven into the overburden by the weight of the section. The master control can adjust the elevation of the section as little as 1/32nd of an inch if required. The control piping is so designed that it is virtually impossible for the operating personnel to "drop" the section by mistake nor will the section drop if the air compressors or piping fail.

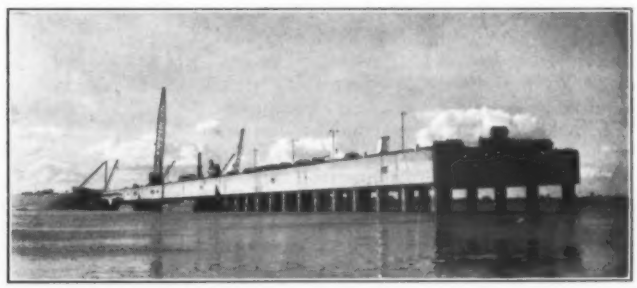
After the dock section is raised to the desired height, the jacks are released one at a time, and the caissons are driven to refusal by a crane-mounted 200-C Vulcan air hammer. After each driving the jacks are again engaged. Finally the jacks are removed one at a time as the caissons are welded to the deck of the barge and cut off flush. The last step is to fill the columns with sand or concrete and close their tops with a welded cover plate, when the pier is ready to function to moor, service, and load ships of any size.



Caissons held in position by air jacks until barge is jockeyed into final position. Caissons are then dropped to river bottom and air jacks lift dock to required height.



Air jacks in process of raising pier section out of the water.



Finished pier 82-ft. wide by 1130-ft. long, supported on 78 caissons driven to rock.

Underside view of pier

The superiority claimed for this type of pier rests in the cutting down of the amount of field construction required, and the consequent great erection speed and savings in cost. It is estimated that field work requires only one-tenth the time and labour that are generally required in the construction of conventional piers or wharves.

A further advantage is that the pier can be fabricated at any foreign yard, thus taking advantage of local steel prices, local labour and reducing to a minimum the length of tow. Again, while the structure is designed as a heavy duty installation, such as the ore and cargo handling wharf on the Orinoco, when expediency and occasion require, the DeLong pier can be easily jacked down to water level, the columns cut loose and extracted from the ground, thus salvaging virtually the entire installation at a minimum cost.

According to the DeLong Company, over ¼ million sq. ft. of this type of pier is in use or under construction.

Manufacturers' Announcements

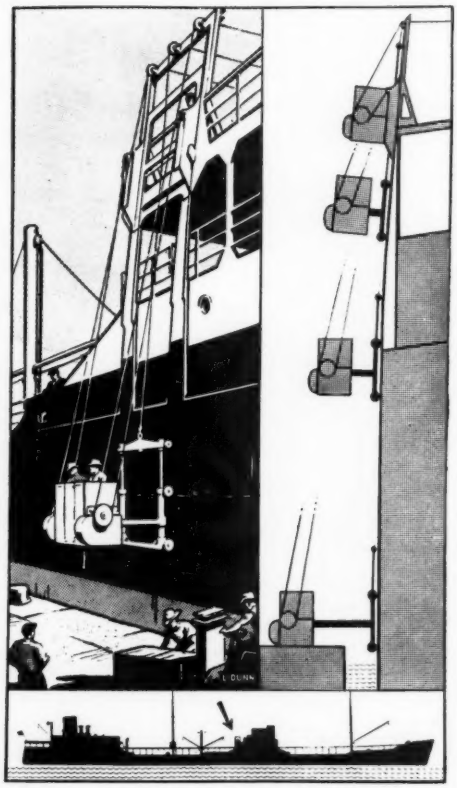
Oil Tanker with Several New Features

Designed to be the safest oil tanker yet built in the world, the turbo-electric steamer " Helix " was recently launched from the yard of Swan Hunter and Wigham Richardson Ltd., at Wallsend-on-Tyne. She is the first of 50 similar vessels, totalling 900,000 d.w. tons, either under construction or on order for the Shell Tanker Fleet. All these ships have been designed for world wide trade as " general purpose " tankers since their deadweight capacity of 18,000 tons is now regarded as the size giving the widest range of utility for all tanker operations. They will, in fact, be able to trade at more than 200 oil ports.

The new safety features in " Helix " are designed to eliminate the risk of fires and explosions due to escaping gases. The first aim of preventing the gases escaping from the tanks is achieved by special equipment which makes it unnecessary to uncover any opening in the tanks either for loading or discharging, or to obtain any information regarding the cargo's volume and other characteristics. If, however, there is an accident and dangerous gases do escape in a quantity to envelope the ship, then they are prevented by other devices from entering those parts of the ship where naked lights are in use i.e. the galley, the boiler room and the smoke room. In effect, therefore, there will be no greater risk of fire on this tanker than on any other type of passenger or cargo ship.

Electric Overside Lift.

Another new feature to be incorporated for the first time in any ship is an electrically-operated overside lift. This patented lift, which will transport six persons or 10 cwt. of stores at one time, is not affected by the list or trim of the vessel and is not dependent upon guide rails. It will considerably ease the difficulty of getting on or off an oil tanker which, as its cargo is discharged, rises up in the water to such an extent that the gangway is often at a very steep inclination. The hoist can be rigged in a fraction of the time required to place either a gangway or companion ladder in position, and only two men are needed for this operation. The Quartermaster or watchman has complete control over those boarding or leaving the ship, and cargo packages up to ½ ton in weight may be easily loaded aboard. Important too, as an aid to hygiene, is the fact that the lift helps to prevent rats getting on or off ship.



The method of rigging, which can be on either side of the ship, is shown in the accompanying illustration; the car is fitted with four small castor wheels and four rubber-tyred wheels positioned so that when the car is hoisted or lowered the wheels will bear against and run freely up and down the ship's plating. The car is constructed of light aluminium alloy or steel and the supporting cable is attached to the upper part of the car, and passes over suitably placed pulleys and sheaves to lead to a centrally-mounted winch. A proportionate movement of separation between the car body and the plane of the wheel axles ensures that contact pressure of the rubber wheels against the ship's side is maintained throughout the operation.

The winch is gear-driven by an electric motor, usually 5 h.p., giving a car speed of 40-ft. per minute, and fitted with an automatic brake. Safety limit switches automatically come into operation should the unit be overloaded or subjected to any abnormal strain.

Duplicate master controllers are fitted on port and starboard sides of the ship, and either one is selected by a central change-over switch.

Pumping Equipment.

The cargo pumping equipment on the " Helix " is also unique. The centrifugal pumps are vertically disposed and driven by steam turbine engines, and a novel cargo pipeline enables this single pumproom ship to carry at one time the same number of different grades of petroleum as a ship having two separate pumprooms.

All the new features in " Helix," which was built at a cost of about £1 million. have been designed and developed by Shell's marine research department.

Mechanical Handling Equipment

Thos. W. Ward, Ltd., Sheffield and branches, have been appointed official general distributors of the " Staffa " Mobile Crane.

This is a versatile general purpose crane which has a forward mounted jib, with its derricking action hydraulically operated, fixed in line with the chassis. A counterweight gives maximum stability under all conditions of load and ground conditions. Constructed to lift 2/3 tons, the " Staffa " has standard type car controls and the hydraulic luffing mechanism is controlled from the normal driving position.

With the jib horizontal the crane has an overall height of slightly more than 10-ft. In this position the lifting capacity is 1¼ tons, which adds considerably to the value of the crane for interior work such as the unloading of box rail wagons.

The same company are also handling the distribution of " Wetherill-Hydraulic " Loading Shovels. These loaders have such sensitive scoop and side arm control that their use is not limited to shovelling and loading of loose materials: they can load and stack bales, barrels and other bulky items. Three scoop sizes are available, ¾ cub. yard, 1 cub. yard and 1¼ cub. yard, and maximum loads up to 1 ton can be carried.

Fitted with dozer blade, the shovel is capable of most levelling, piling and spreading jobs, and the Fordson Major Tractor to which the Wetherill mechanism is fitted affords ample power for all conditions of service.

Fork-Lift Trucks for China

During September, 1952, I.T.D., Ltd. (Industrial Truck Development), a technical sales organisation owned jointly by The Austin Motor Company and Crompton Parkinson, Ltd., were informed that the China National Import and Export Corporation were open to consider a tender for the supply of modern types of mechanical handling equipment.

Since there has been reciprocal trading between Great Britain and China for centuries past and China has a favourable trading balance with this country, it was decided to seek the advice of the Board of Trade and the Ministry of Supply to determine what could be done to stimulate business in this particular instance.

After due consideration, the Board of Trade issued an export licence to cover the supply of fork-lift trucks, platform trucks, service parts and other ancillary equipment to the value of £500,000.

This order is the largest single transaction for mechanical handling equipment of this type ever to be obtained by a British manufacturer and the first shipment to the value of almost £100,000 left Birkenhead early this month.

Special arrangements have been made to produce instruction plates on the machines which give Chinese as well as English equivalents. Supplies of essential spare parts will accompany each one of the machines, all of which have been subjected to the latest packing techniques. This was necessary to ensure that the equipment arrives in perfect condition ready for immediate use at the end of journeys which may be anything between 15,000 and 20,000 miles by road, rail, sea or air transport.

Manufacturers' Announcements—continued

Self-Unloading Ore Carrier

A new type of ore-carrying ship, the S.S. "Carl Schmedeman," has recently been equipped to unload bauxite ore by means of an internal materials handling plant manufactured and installed by the General Electric Co., Ltd., London. The vessel, built by Vickers Armstrongs Ltd. for Reynolds Jamaica Mines Ltd., is 518-ft. length overall and 66-ft. breadth moulded, with a deadweight of 13,150 tons, and the conveying equipment has been designed to handle ore with a maximum screen size of ¾-in. weighing some 66 lb. per cu. ft. at a maximum rate of 1,400 tons per hour.

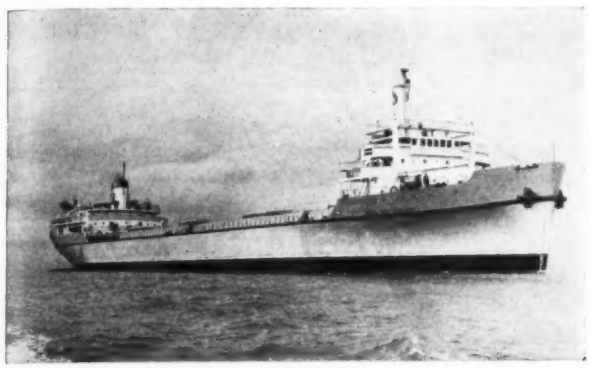


Fig. 1 (top left): The S.S. "Carl Schmedeman."

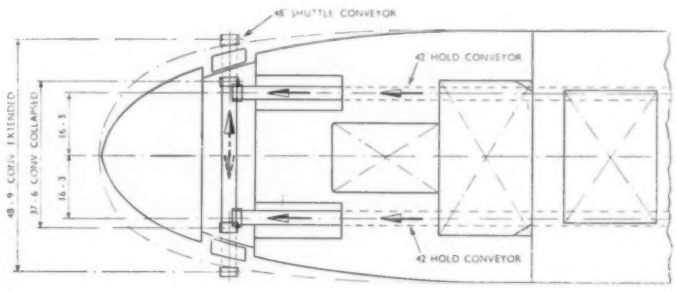


Fig. 2 (top right): Diagrammatic arrangement of hold and shuttle conveyors.

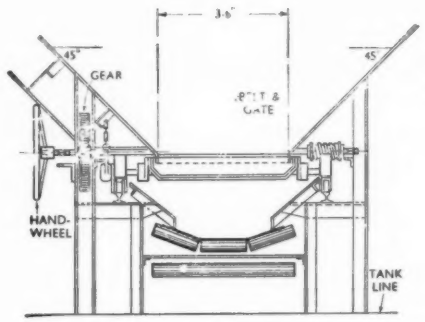


Fig. 3 (bottom left): Diagrammatic section of main conveyor and hopper arrangement.

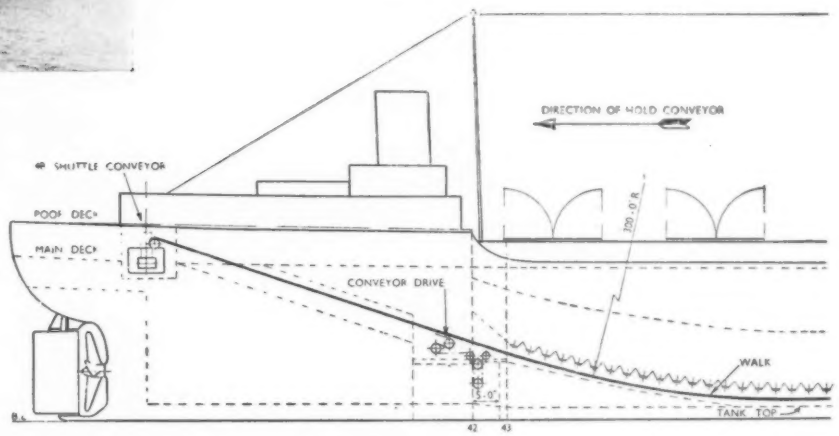


Fig. 4 (bottom right): The 38-ft. rise of the main conveyors beyond the holds to the shuttle conveyor level.

Hold Conveyors.

The special holds are equipped with 152 hopper gates, operated by a handwheel through gears and chain on grooved drums, enabling the ore to be discharged by gravity on two hold conveyors of Robins design, each 397-ft. long and 42-in. wide. The conveyor belts are of cotton, impregnated with rubber and rubber-covered, and the conveyors operate on special Robins 42-in. three-pulley, roller-bearing troughing idlers at approximately 2-ft. centres under the holds. Beyond the holds, the conveyors have a rise of 38-ft. with idlers spaced at approximately 3-ft. centres. At a belt speed of 360-ft. per minute, the maximum capacity of both conveyors is 1,400 tons per hour, the approximate weight of each hold conveyor unladen being 64,000 lb., and the weight of the gates and operating gear approximately 225,000 lb. Each conveyor is driven through 9,733 to 1 speed reducing gears and flexible couplings by a totally enclosed electric motor continuously rated for 100 h.p., at 1,750 r.p.m.

Shuttle Conveyor.

Each hold conveyor discharges to a reversible shuttle conveyor mounted athwartships and discharging from either side of the vessel at will, through specially-constructed side doors. This shuttle conveyor has a length at rest of 37-ft. 6-in. and extends, by pneumatic operation, 11-ft. 3-in. through the ship's side. When not in operation, it is housed inboard.

The 48-in. belt of the shuttle conveyor is carried on 48-in., three-pulley, roller-bearing troughing idlers. With a speed of 515-ft. per minute, this belt is capable of handling the output of both hold conveyors at the maximum unloading rate. The shuttle conveyor is driven through 15.6 to 1 reduction gearing, flexibly coupled to a G.E.C. continuously-rated 20 h.p. squirrel-cage, reversible electric motor, running at 1,750 r.p.m. The weight of the shuttle conveyor, including the extension gear, is approximately 26,000 lb.

In addition to the shipboard equipment and electrical control gear, the Fraser and Chalmers Engineering Works of the General Electric Co., Ltd. supplied the idlers, pulley outfits and bunker discharging gates for the shore-to-ship loading plant.

Diesel Shunting Locomotives

In the year 1937 a 110 h.p. diesel mechanical shunting locomotive was supplied by the firm of Robert Stephenson and Hawthorns, Limited to meet special service requirements in the steel works of Messrs. Thos. Firth and John Brown Limited, and to this firm have been recently supplied two more powerful diesel locomotives which are now operating on heavy shunting duties in their Sheffield steel works.

These new locomotives are of the 0-4-0 type and are fitted with the Crossley Brothers 4ERT type direct reversing diesel engine, the general lay-out being very similar to that of the 300/330 h.p. Stephenson-Crossley locomotives with 0-6-0 wheel arrangement supplied to the British Electricity Authority and exhibited at the Festival of Britain South Bank Exhibition in 1951. The engine is of the Crossley four-cylinder, two-cycle, loop scavenge type having a one-hour traction rating of 220 b.h.p. at 750 r.p.m. The cylinder bore is 7-in. and the stroke 9-in.

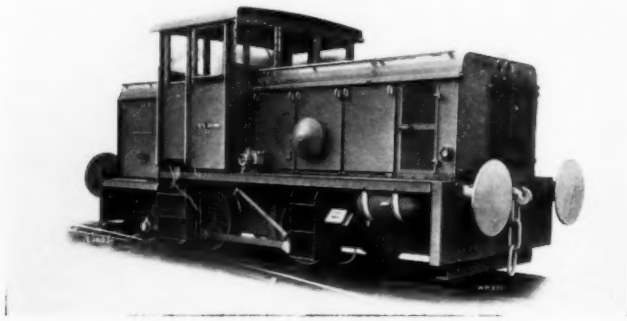
Although designed for heavy duty, the engine is exceptionally compact and its manœuvring properties are excellent. Being of the direct-reversing type, the transmission is designed without the added complication of reversing gear. The drive is through a hydraulic coupling and three-speed gearbox to a jackshaft.

One handwheel fitted in the locomotive cab controls starting, stopping and reversing of the engine, reversing being carried out

Manufacturers' Announcements—continued

exceptionally quickly and with the same simplicity as a steam engine. The only other engine control is that for controlling the speed from idling at about 300 r.p.m. up to the full speed of 750 r.p.m.

The cylinder block and crankcase are cast in one piece which is provided with through bolts up to the frame top level, thereby relieving the crankcase portion of direct tensile stresses. The



New 0-4-0 type Shunting Locomotive.

cylinder heads are of simple design manufactured from a semi-steel material and incorporating a unique feature of expansion slots in the outer wall. As there are no exhaust and air intake valves in the cylinder head they are immune from cracking troubles.

The scavenge pump is located at the free end of the engine and is of the double-acting tandem type, driven by means of a separate crankshaft bolted through a flange coupling to the main crankshaft.

The "Vulcan-Sinclair" traction type hydraulic coupling, size 32 was made by The Fluidrive Engineering Co. Ltd., Isleworth.

The three-speed gearbox was designed and manufactured by Messrs. Bostock and Bramley Limited, Stalybridge, and follows the design of the 300/330 h.p. size. It has been designed on simple straightforward lines to meet the heavy and arduous duty of a diesel mechanical shunting locomotive, and a special feature is that only three gearwheels are in contact at any time whichever speed is engaged.

The pneumatic control unit supplied with the gearbox consists of a series of cam-operated air valves and, in keeping with the gearbox comprises a simple trouble-free unit which can be mounted at any point on the locomotive. This method of control ensures engagement of gears in the correct sequence by the air pressure and makes possible the provision of a simple cab control requiring little skill or effort on the part of the driver.

The controls are duplicated on each side of the cab. They are contained in a desk, and consist of engine throttle, gear change lever, engine starting and reversing hand wheel, air brake, air sanding control, and electric horn. The cab is totally enclosed, but the driver has a completely unobstructed view in all directions. Drop windows are provided at the sides, and the end windows, being fixed, are fitted with wind-screen wipers. The locomotive is equipped with C.A.V. electric lighting equipment, ensuring adequate illumination of the cab interior and the various instruments.

The leading particulars of the locomotives are as follows:

Wheel arrangement	0-4-0
Gauge	4-ft. 8½-in.
Wheelbase	6-ft.
Wheels, diam.	3-ft. 4½-in.
Weight in Working Order ...	30 tons
Fuel capacity	150 galls.
Minimum curve	47-ft.

	MPH	TE. Lbs.	HAULING CAPACITY—TONS				
			On Level	1 in 200	1 in 100	1 in 50	1 in 33.3
1st Speed	3.82	17250	1407	783	502	283	191
2nd ,,	6.71	9850	790	434	274	148	96
3rd ,,	11.1	5950	465	250	153	78	46

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ABERDEEN HARBOUR COMMISSIONERS.
HARBOUR ENGINEER'S DEPARTMENT.

Applications are invited for the post of JUNIOR ENGINEERING ASSISTANT in the Harbour Engineer's Office, Aberdeen. Applicants should have Drawing Office experience in general civil engineering design.

The salary rises, on age scale, from £360 at 25 years to £450 at 32 years. The appointment is subject to the Commissioners' Superannuation Scheme and the candidate selected will require to pass a medical examination before appointment.

Applications, stating age and qualifications, with full details of experience, together with copies of recent testimonials, should be lodged with the Harbour Engineer, 15, Regent Quay, Aberdeen, not later than 16th February, 1953.

Harbour Engineer's Office, Aberdeen.
13th January, 1953.

CIVIL ENGINEER required for Planning work in Head Office. About 10 years' varied site experience with contractors and technical qualifications essential. A permanent position with wide scope and interest for the right man. Write, giving details of experience, etc., to Planning Dept., George Wimpey & Co., Limited, 27, Hammersmith Grove, London, W.6.

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